Service Manual

DR2800

DOC222.52.00763 Aug07
Version 2.1

Servicerelevante Änderungen

Bitte die nachfolgenden Änderungsmitteilungen beachten!

Service Modifications

Please note the change orders and service information!

Service Support Newsletter

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Laboratory Analysis Photometer

DR 2700 Spectrophotometer

The product DR 2700 is based on the DR 2800. The DR 2700 will be sold in the US and in RoW countries. The DR 2700 is a low price version without barcode reader unit, barcode motor and hall sensor board. Most of the used parts in both instruments are the same. Different are the main board, accu board, display frame (designator), the firmware and the filter wheel (no measurements between 340 and 400nm).
No HACH TNTplus or LANGE LCK chemistry test can be used on the DR 2700.

Important: As spare part for the accu board and main board we use the spare parts of the DR 2800! Please see for different spare parts the list below.

The firmware of the DR 2700 is part of the service software package VAA608 and available as download from our service knowledgebase. There you can find also the revised service manual and spare part list:

Software VAA608:	http://service.hach-lange.ewqg.com/article.aspx?id=10106
Service Manual:	http://service.hach-lange.ewqg.com/article.aspx?id=10007
Spare part list:	http://service.hach-lange.ewqg.com/article.aspx?id=10076

Das DR 2700 ist eine Variante des DR 2800 mit reduzierter Hardware. Es wird nur in den USA und RoW verkauft.
Es wurden die Barcodeleseeinheit, der Barcode Motor und die Hallsensorplatte entfernt. Die Bestückung der Akku- und Rechnerplatte wurden reduziert. Bei dem Filterrad wurde ein Filter entfernt (keine Messungen zwischen 340 und 400nm).
Es können keine HACH TNTplus oder LANGE LCK Tests auf dem DR 2700 gemessen werden.

Wichtig: Als Ersatzteil für die Akkuplatte und Rechnerplatte werden die Ersatzteile des DR 2800 benutzt! Die geänderten Ersatzteile sind in der unten stehenden Liste zu finden.

Die Software des DR 2700 ist Bestandteil des Service Software Pakets VAA608 und in der Service Knowledgebase / Wissensdatenbank als Download verfügbar. Dort sind auch das Service Manual und die Ersatzteilliste zu finden:

Software VAA608:	http://service.hach-lange.ewqg.com/article.aspx?id=10106
Service Manual:	http://service.hach-lange.ewqg.com/article.aspx?id=10007
Ersatzteilliste:	http://service.hach-lange.ewqg.com/article.aspx?id=10076

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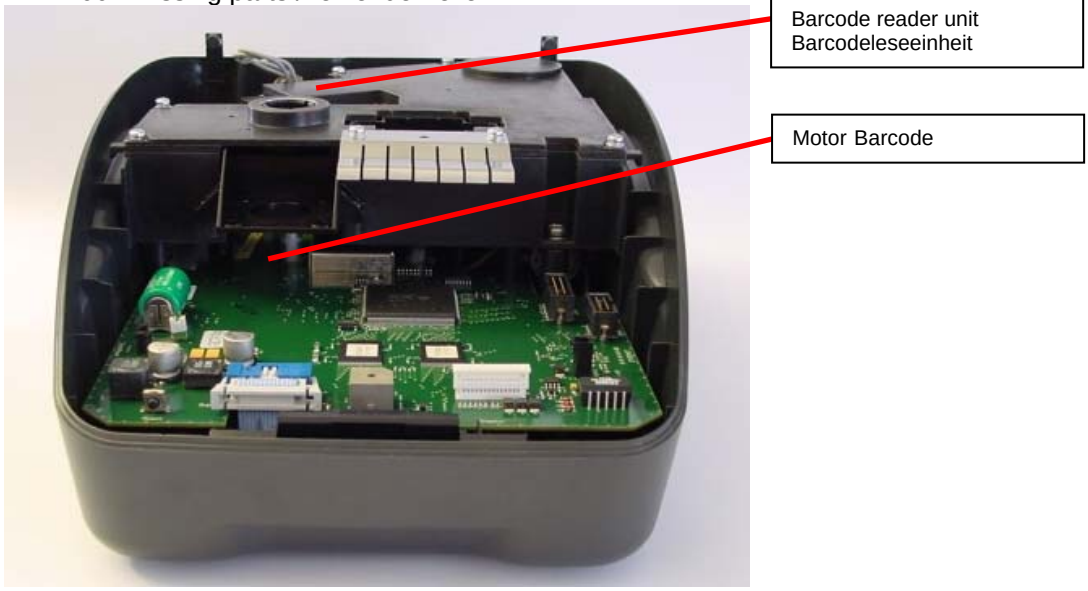
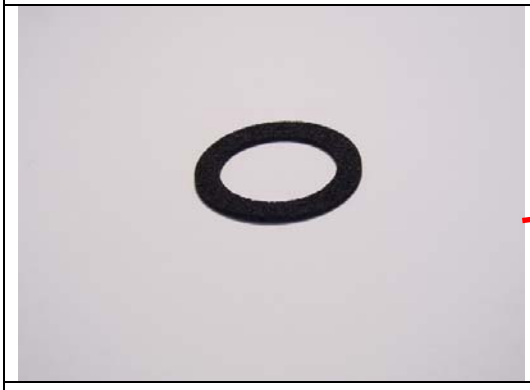
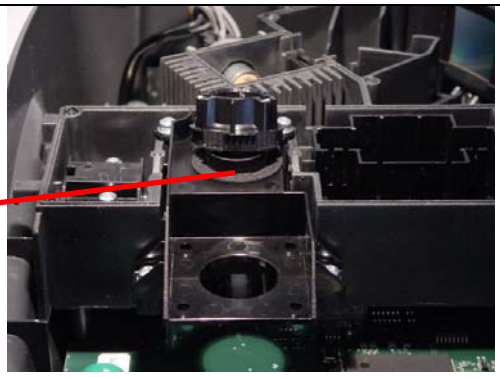
DR 2700 –Missing parts / fehlende Teile



New spare parts for DR 2700 / Neue Ersatzteile für das DR 2700	
Pressure ring **Andruckring** Order no. / Bestell-Nr.: LZM359	Installation position: Einbaulage im Gerät:
	
Display frame DR 2700 **Displayrahmen DR 2700** Order no. / Bestell-Nr.: LZV771	**Filter wheel with optical filters** **Filterrad mit Filtern** Order no. / Bestell-Nr.: LZV772

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Laboratory Analysis Photometer

DR 2800 / DR 5000 Spectrophotometer – Software Update VAA608

A new software service package VAA608 for DR 2800 and DR 5000 is available.
Please download the file from our Service Knowledgebase with the follow link:
http://service.hach-lange.ewqg.com/article.aspx?id=10106

Please extract the file "VAA608.zip" and copy / overwrite it on your USB memory stick VAA608.

Modifications: DR 2800 – Version 1.03
We modified the internal test program and the calibration (Hardware Check – Adjust) of the filter wheel. This was necessary, because we introduced a new optical filter glasses for the wavelength from 375- 480nm into the DR 2800.

With modification of the internal test program we changed also the version number of the operating system to 1.03, although we did not modify the customer menu.

Important: Please use for a Hardware Check – Adjust, e.g. after exchanges the filter wheel, maintenance and update of software always the latest file of VAA608.zip. This latest software service package support all types of DR 2800 and DR 5000.

Es gibt ein neues Software Service Paket VAA608 für das DR 2800 und DR 5000.
Die Datei „VAA608.zip“ kann aus der Service - Wissensdatenbank / Knowledgebase über folgenden Link heruntergeladen werden:
http://service.hach-lange.ewqg.com/article.aspx?id=10106

Bitte die vorhandenen USB-Sticks VAA608 mit dem Inhalt der Datei "VAA608.zip" überschreiben.

Änderungen: DR 2800 – Version 1.03
Das interne Testprogramm wurde überarbeitet und die Kalibrierung (Hardware Check – Adjust) für das Filterrad geändert. Das wurde notwendig, weil ein neues optisches Filterglas für den Wellenlängenbereich 375-480 nm beim DR 2800 eingesetzt wird.

Mit der Änderung des Testprogramms wurde auch die Versionsnummer des Anwenderprogramms auf 1.03 erhöht, obwohl für den Anwender im Kundenmenü keine Änderungen erfolgt sind.

Wichtig: Bei einem Hardware Check – Adjust z.B. nach Austausch des Filterrades und zum Updaten der Software immer die aktuellste VAA608.zip benutzen. Das Softwarepaket unterstützt alle Gerätevarianten vom DR 2800 und DR 5000.

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Laboratory Analysis Photometer

DR 2800 eco Spectrophotometer

Introduction:

DR 2800 eco will be a defeatured version of the DR 2800 to meet customer's expectation on price and performance at the lower end of MPP spectrophotometers.

Main differences between DR 2800 and DR 2800eco are:

- The main needed waste water LCK's stored in the instrument
- 13mm only (No HACH tests)
- Barcode, but no 10-fold measurement (Quality)
- Limited parameters (Less flexibility for the future)
- Reduced Data Storage (only 200 data points)
- No free programming and Absorbance measurement
- No Battery

Please find more sales information in attached files "PIB DR 2800 eco.pdf" and "DOC062_52_20004_Jun07_small.pdf".

Service Information:

The hardware is identical to DR 2800 except another display frame.

Display frame DR 2800eco
Order No: LZV769

It is not possible to upgrade or switch a DR 2800 eco to a DR 2800.

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Allgemeines:

Das DR 2800 eco ist eine Variante vom DR 2800 mit reduziertem Funktionsumfang um die Kundenerwartungen in Bezug auf Preis und Leistung zu erfüllen.

Die Hauptunterschiede zwischen dem DR 2800 und DR 2800 eco sind:

- The meist gebrauchten LCK Tests sind im Instrument abgespeichert
- Nur 13 mm - keine HACH Tests
- Barcode, aber keine 10fach Messung (Qualität)
- Eingeschränkte Parameter (weniger flexibel für die Zukunft)
- Reduzierte Datenspeicherung - nur 200 Messwerte
- Keine freie Programmierung und Extinktionsmessung
- Kein Akku

Mehr Informationen finden Sie in den beigefügten Dateien “PIB DR 2800 eco.pdf” und “DOC062_72_20004_Jun07_small.pdf“.

Service Information:

Die Hardware des Gerätes ist identisch zum DR 2800, bis auf den geänderten Displayrahmen.

Display frame DR 2800eco
Order No: LZV769

Es ist nicht möglich ein Upgrade von einem DR 2800 eco zu einem DR 2800 durchzuführen.

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Laboratory Analysis Photometer

Spectrophotometer – VAA309 COD test cuvette

Dear colleagues,

the current batch of the test tool seems to be not stable. The measured values @340nm and 440nm are approx. 10 mAbs lower than the nominal value.

Most of the tested equipment will not pass the checking.

Please change the nominal value manually if possible.

If you need a corrected sheet with the nominal values please contact servicesupport with the details of your set before 6. June 2007.

A new batch of VAA309 will be available by end of July 2007.

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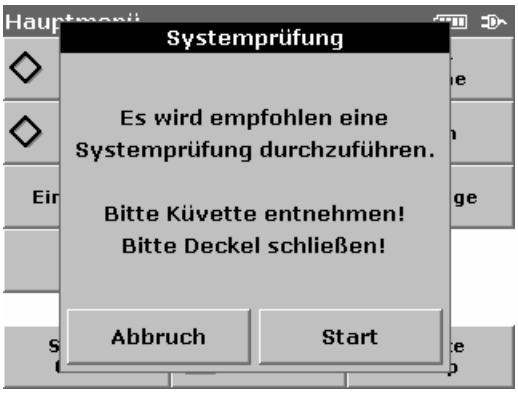
Laboratory Analysis Photometer

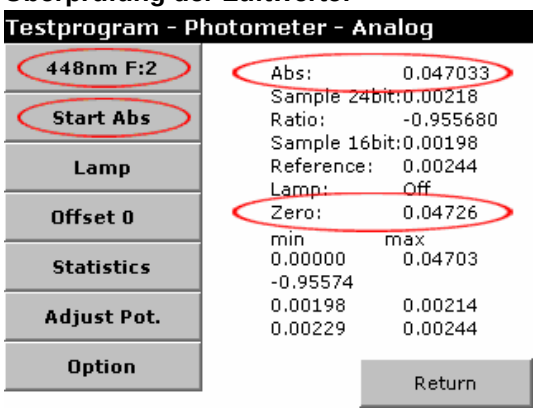
DR 2800 Spectrophotometer – Luftwerte für LCK Barcode Tests / air values for LCK barcode tests

Bei LCK Barcodemessungen werden die Messergebnisse auf einer im Gerät abgespeicherten Luftmessung bezogen errechnet. Beim Einschalten des DR 2800 (Systemtest) wird bei 560nm der Luftwert gemessen und mit dem abgespeicherten Luftwert verglichen. Wird eine Abweichung größer 4 mExt festgestellt, erfolgt die Aufforderung zu einer Systemprüfung:



Achtung: Vor dem Start der Systemprüfung ist es sehr wichtig zu prüfen, ob der Lichtschutzadapter (light shield) bündig eingesetzt ist (siehe Bild). Wenn dieser nicht richtig eingesetzt wird, könnte der Lichtstrahl abgeschnitten und damit falsche Luftwerte abgespeichert werden.

Überprüfung der Luftwerte:



- Das Testprogramm des DR 2800 starten
- Das Menü Photometer, AD aufrufen
- Die gewünschte Wellenlänge des LCK Barcodetests auswählen (z.B. 448 nm)
- Den Lichtschutz einsetzen
- Den Button Start Abs betätigen

Der Wert **Zero: 0.04726** ist der abgespeicherte Luftwert in Ext (47.26 mExt). Der Wert **Abs: 0.047033** ist der gemessene Wert (47.033 mExt). Diese beiden Werte dürfen nicht mehr als **4 mExt** voneinander abweichen. Der absolute Wert sollte nicht größer als 250 mExt sein.

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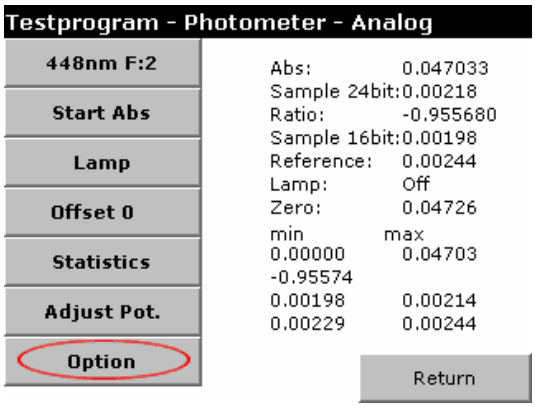
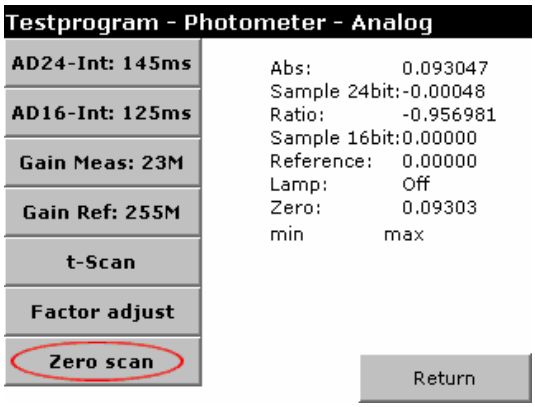
Sollte die Abweichung größer 4 mExt sein, ist die Luftmessung im Testprogramm neu zu starten:

- Den Button Option betätigen
- Den Button Zero Scan betätigen



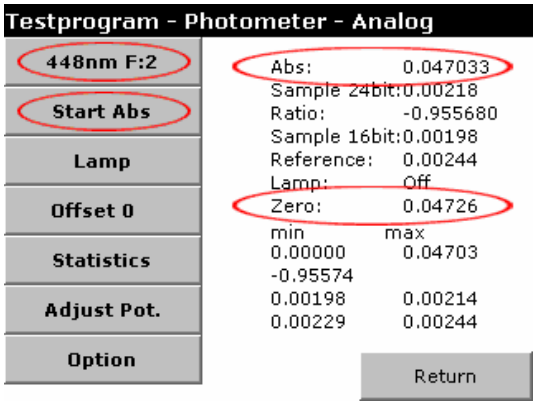


Die Klappe des DR 2800 schließen. Die Meldungen Remove all cuvettes!, Execute a scan…, Check Zero-Scan… mit OK bestätigen.
Alternativ dazu kann im Testprogramm im Menü Inspektion ein Hardware Check (Adjust) ausgeführt werden.

The calculation of measuring results of our LCK barcode cuvettes depends on stored air values. During start up (System Check) the DR 2800 compares one measured air value by 560 nm against the stored air value. Is the difference more than 4 mAbs a request to execute a full system check appears.

Note: Before starting the full system check please verify that the light shield adapter is inserted (see photo). If the adapter is not placed correctly, it could happen that the light beam will be cut off and wrong air values will be stored.

Check of air values:

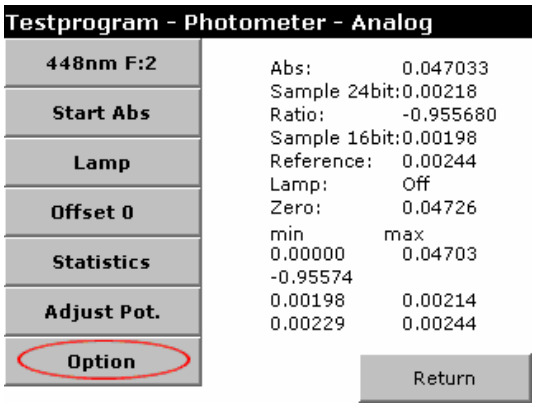


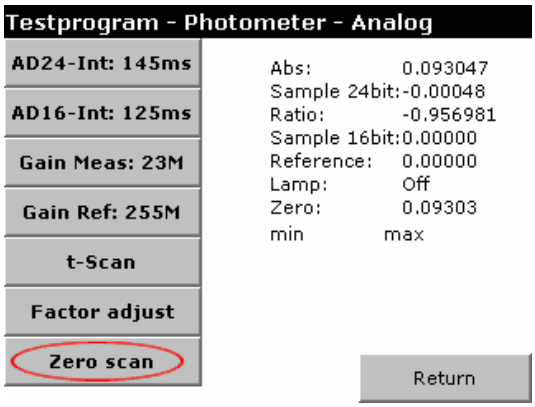
- Start the factory service menu (test program)
- Select menu Photometer, AD
- Select the desired wavelength of the LCK barcode cuvette test (e.g. 448 nm)
- Insert the light shield adapter
- Touch button Start Abs

The value **Zero: 0.04726** (47.26 mAbs) is the stored air value. The value **Abs: 0.047033** is the measured value (47.033 mAbs). Both values should not show a greater difference than **4 mAbs**. The absolute value should exceed 250 mAbs.

Is the deviation more than 4 mAbs the measurement of the air values should be executed in the test program:

- Touch button Option
- Touch button Zero Scan





Close the lid of the DR 2800. Confirm the messages Remove all cuvettes!, Execute a scan…, Check Zero-Scan… with touch OK button.
Alternatively execute a Hardware Check (Adjust) in test program menu Inspection.

Service Support Newsletter

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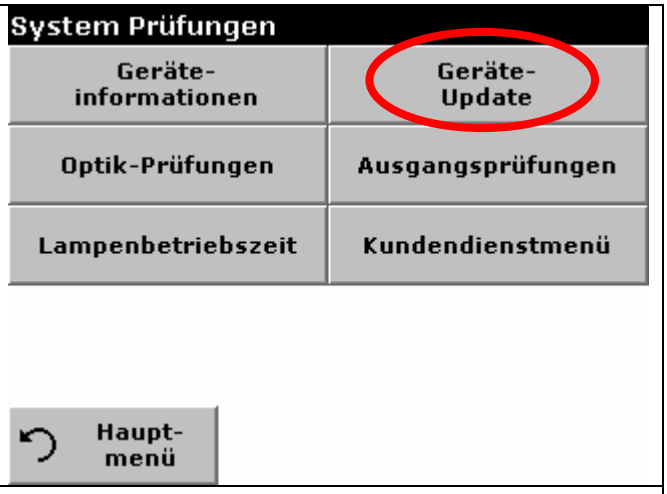
Laboratory Analysis Photometer

DR 2800 / DR 5000 Spectrophotometer – Software Update Information VAA608

Das Updaten auf eine neue Softwareversion (siehe auch „Service Support Newsletter 08_2007 DR 2800 DR 5000 Software VAA608“) mit dem USB Stick VAA608 kann auf zwei verschiedenen Wegen erfolgen:

1. Update im Kundenmenü
Das Gerät einschalten (USB Stick VAA608 noch nicht einstecken). Den Systemtest abwarten.

- auf System Check drücken



- auf Geräteupdate drücken

Jetzt den USB Stick VAA608 einstecken und mit OK bestätigen. Das Update wird automatisch durchgeführt.

Achtung: **Sämtliche kundenspezifischen Einstellungen (Anwender-ID, Proben-ID), abgespeicherte Messergebnisse und selbst erstellte Anwenderprogramme bleiben erhalten!**

Dieses Update nach der Inspektion etc. nutzen!

2. Update im Testprogramm
Den USB Stick VAA608 in das Gerät einstecken und einschalten – das Testprogramm startet automatisch.

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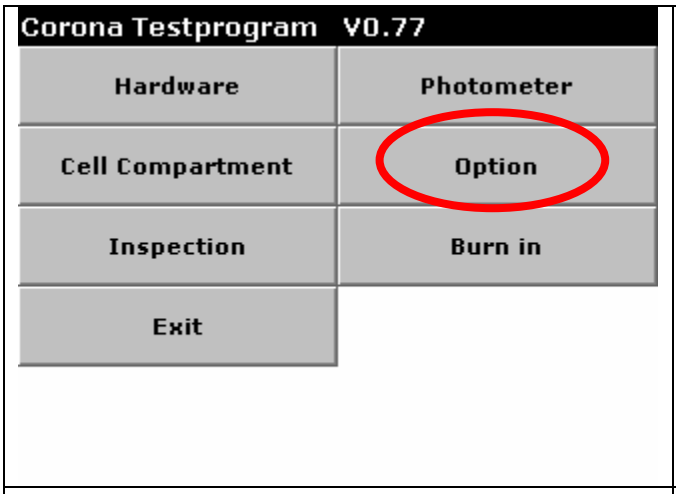
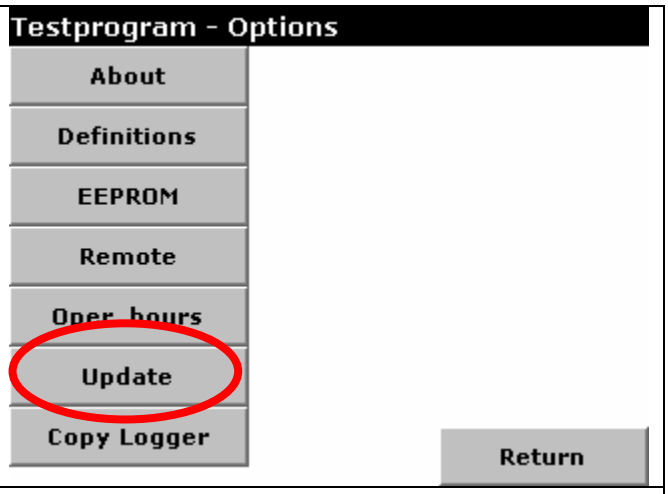


- auf Option drücken



- auf Update drücken

Nach dem erfolgreichen Update den USB Stick VAA608 entfernen und das Gerät aus- / einschalten.

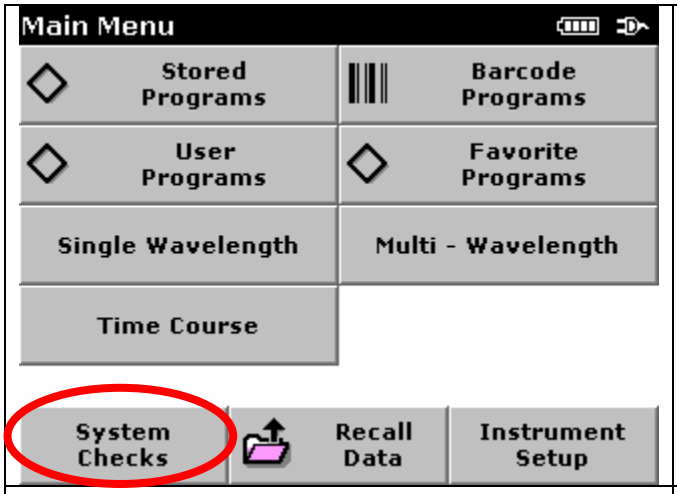
Achtung: **Sämtliche kundenspezifischen Einstellungen (Anwender-ID, Proben-ID), abgespeicherte Messergebnisse und selbst erstellte Anwenderprogramme werden gelöscht!**

Dieses Update bitte nur nutzen, wenn das Gerät wie nach Werkauslieferung konfiguriert werden soll oder nach einer Reparatur die Rechnerkarte getauscht worden ist.

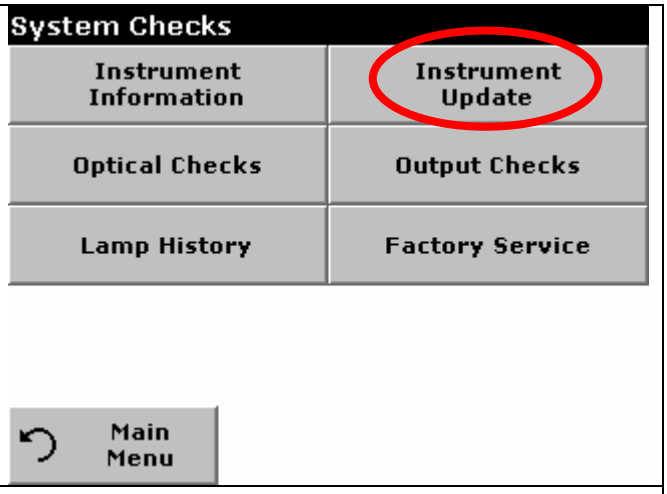
The upgrade to a new software version of DR 2800 / DR 5000 (see „Service Support Newsletter 08_2007 DR 2800 DR 5000 Software VAA608“) with USB memory VAA608 can be done in two different ways:

1. Update via customer menu

Switch on the instrument (do not insert USB memory VAA608 beforehand). Wait until the system check is done.



- Touch System Check



- Touch Instrument Update

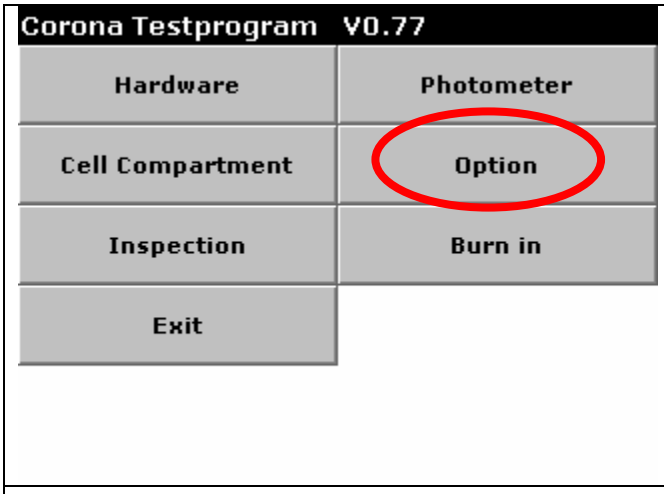
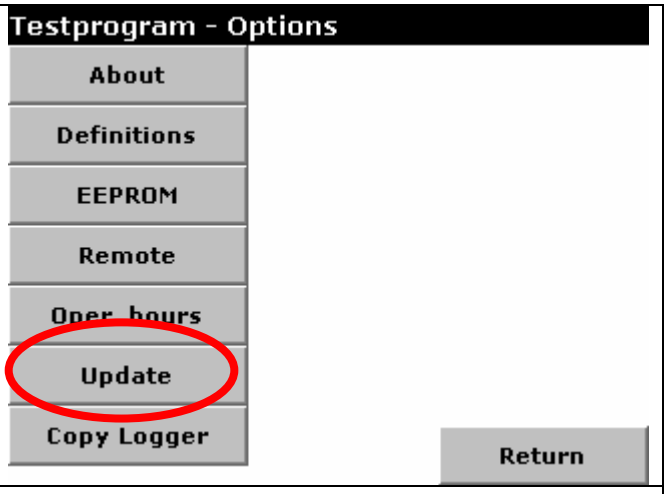
Insert the USB memory VAA608 and confirm with OK. The update process starts automatically.

Note: **All customer specific information (User-ID, Sample-ID), stored measuring results and user programs are still in place after the update!**

Please use this method to update the instrument after maintenance and inspection!

2. Update via test program

Plug in the USB memory VAA608 into the instrument and switch on the instrument – the test program starts automatically.

	
- Touch Option	- Touch Update

After the successful update remove USB memory VAA608 and switch off / on the instrument.

Note: All customer specific information (User-ID, Sample-ID), stored measuring results and user programs will be deleted after the update!

Please use this method to update the instrument after replacement of the main board or to reset the instrument to the factory default values.

Service Support Newsletter

HACH LANGE
UNITED FOR WATER QUALITY

Volume / Ausgabe:	14 / 2007	Date / Datum:	March 15, 2007
From / Von:	HLE Service Support	Information is prepared for internal support only.	
E-Mail:	servicesupport@hach-lange.de	Nur für internen Gebrauch.	

Laboratory Analysis Photometer

DR 2800 Spectrophotometer – Linsenset / Set of Lenses LZV587

Die Stückliste des Ersatzteiles Linsenset LZV587 war falsch und wurde korrigiert.
LZV587 alt: 1 x BOL014 (Linse A), 2 x BOL015 (Linse B), 1 x HOL033 (Linse C)
LZV587 neu: 2 x BOL014 (Linse A), 1 x BOL015 (Linse B), 1 x HOL033 (Linse C)

Die auf den Servicelagern vorhandenen LZV587 bitte entsorgen. Die Lagerabbuchung wird von Servicesupport veranlasst. Die an Lager Berlin verfügbaren LZV587 wurden überarbeitet.

The bill of material (BOM) of the spare part “set of lenses LZV587” contained an error and has been revised.
LZV587 old: 1 x BOL014 (lens A), 2 x BOL015 (lens B), 1 x HOL033 (lens C)
LZV587 new: 2 x BOL014 (lens A), 1 x BOL015 (lens B), 1 x HOL033 (lens C)

Please dispose of the LZV587 still in stock. The service support is responsible for scraping it from the system. The LZV587 on stock in Berlin has been modified.

1 – BOL014 (Linse A) 2 Stück 2 – BOL015 (Linse B) 1 Stück 3 – HOL033 (Linse C) 1 Stück	1 – BOL014 (lens A) 2 piece 2 – BOL015 (lens B) 1 piece 3 – HOL033 (lens C) 1 piece

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Erfüllungsort und Gerichtsstand: Berlin
WEEE-Reg.-Nr. DE 69429787
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Anne De Greef-Safft, Martin Geisel

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Steuernummer: 21118/14850
Finanzamt in 78532 Tuttlingen
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Service Support Newsletter

UNITED FOR WATER QUALITY

Volume / Ausgabe:	11 / 2007	Date / Datum:	March 13, 2007
From / Von:	HLE Service Support	Information is prepared for internal support only.	
E-Mail:	servicesupport@hach-lange.de	Nur für internen Gebrauch.	

Laboratory Analysis Photometer

DR 2800 Spectrophotometer - Mitnehmerring / Drive ring round cuvette 16/13mm

Das Ersatzteil „Mitnehmerring 13mm“ Bestell-Nr. LZV633 wurde durch den „Mitnehmerring 16/13mm“ Bestell-Nr. A23757 ersetzt. Der „Mitnehmerring 16/13mm“ befindet sich schon immer im DR 2800 und hat sich bewährt, so dass der „Mitnehmerring 13mm“ nicht nötig ist.
Bitte bei zukünftigen Bestellungen immer die A23757 benutzen. Die vorhandenen Service Lagerbestände von LZV633 werden auf A23757 umgebucht.

We replace the spare part “Drive ring round cuvette 13mm” order no. LZV633 with the part “Drive ring round cuvette 16/13mm” order no. A23757. The “Drive ring round cuvette 16/13mm” already exists in all DR 2800 and works fine. Therefore the “Drive ring round cuvette 13mm” will become obsolete.
In future please order always the part A23757. The existing parts LZV633 on the local service stocks will be changed to A23757.

A23757 Mitnehmerring 16/13mm

A23757 Drive round cuvette 16/13mm

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Service Support Newsletter

UNITED FOR WATER QUALITY

Volume / Ausgabe:	08 / 2007	Date / Datum: March 12, 2007
From / Von:	HLE Service Support	Information is prepared for internal support only.
E-Mail:	servicesupport@hach-lange.de	Nur für internen Gebrauch.

Laboratory Analysis Photometer

DR 5000 / DR 2800 Spectrophotometer – Software Service Package VAA608

Es gibt ein neues Software Service Paket VAA608 für das DR 2800 und DR 5000. Die Datei ist im Intranet www.hach-lange.net als Download verfügbar (Menü Service / Software). Bitte die vorhandenen USB-Sticks VAA608 mit dem Inhalt der Datei "VAA608.zip" überschreiben.
Es wurden folgende Änderungen durchgeführt:
DR 2800

- Testdaten für den Barcodetest LCK654 Sulfit eingefügt – HACH LANGE Version 53E
- Die HACH Tests 656 (Standard Addition) und 535, 536 (Reagenzien Blank) wurden korrigiert – HACH Version 30

DR 5000

- Testdaten für den Barcodetest LCK654 Sulfit eingefügt – HACH LANGE Version 53F
- Die HACH Tests 656 (Standard Addition) und 535, 536 (Reagenzien Blank) wurden korrigiert – HACH Version 06

Zum Updaten der Geräte während der Inspektion / Reparatur bitte die neuen Dateien benutzen!

Für Kunden ist das Update (nicht die komplette VAA608) im Internet www.hach-lange.de bzw. www.hach-lange.com (Menü Downloads, Software) verfügbar.

A new software service package VAA608 for DR 2800 and DR 5000 is available. Please find the file on our Intranet www.hach-lange.net as download (menu Service / Software). Please extract the file "VAA608.zip" and copy / overwrite it on your USB memory stick VAA608.
We modified the programs:
DR 2800

- Program for barcode cuvette test LCK654 Sulfite inserted – HACH LANGE Version 53E
- For HACH customers especially the tests 656 (standard addition) and 535, 536 (reagent blank) have been corrected – HACH Version 30

DR 5000

- Program for barcode cuvette test LCK654 Sulfite inserted – HACH LANGE Version 53F
- For HACH customers especially the tests 656 (standard addition) and 535, 536 (reagent blank) have been corrected – HACH Version 06

Please use during maintenance the attached file to upgrade the software of the DR 2800 and DR 5000!

For customers the update (not the complete VAA608) is available on our internet homepage www.hach-lange.de or www.hach-lange.com (menu Downloads, Software).

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Service Support Newsletter

HACH LANGE
UNITED FOR WATER QUALITY

Volume / Ausgabe: 05 / 2007 Date / Datum: February 13, 2007
From / Von: HLE Service Support
E-Mail: servicesupport@hach-lange.de

DR 2800 Spectrophotometer

EMC Redesign

The DR 2800 has been redesigned to reduce the production cost. The ferrite cores have been removed by rebuilding the electronic boards (EMC - electromagnetic compatibility). The DR 2800 has received a new article number (see table). This number can be found on the backside of the instrument.

DR 2800	Article number	Variant	Time of production
Old	LPG422.99.00001	HACH LANGE	Nov. 2005 – Nov. 2006
	LPG422.99.00002	HACH	
	LPG422.99.00003	GE	
	LPG422.99.00004	NALCO	
New Redesign	LPG422.99.00011	HACH LANGE	from Dec. 2006
	LPG422.99.00012	HACH	
	LPG422.99.00013	GE	
	LPG422.99.00014	NALCO	

Note: The order numbers for the customers (e.g. LPV422.99.00001) have not changed.

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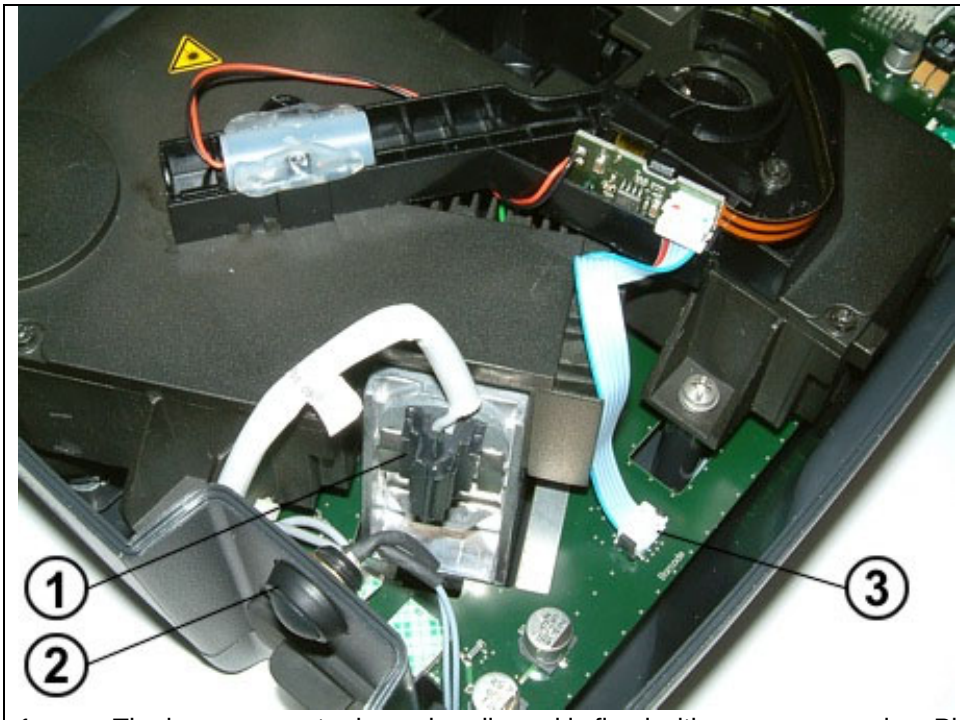
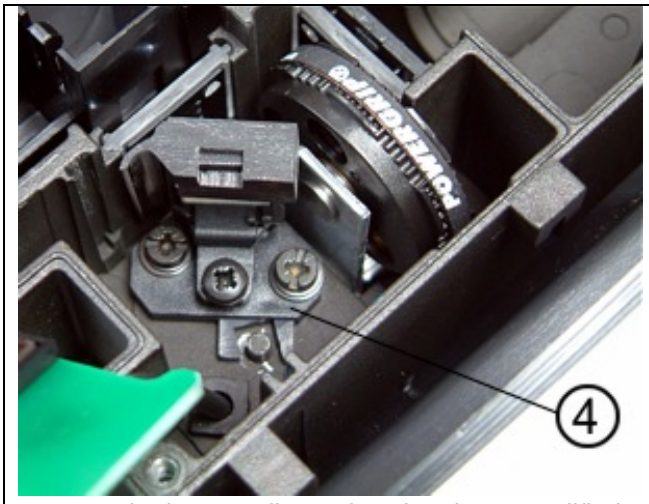
Modification details



1 - The lamp connector has a handle and is fixed with a pressure spring. Please note that after a replacement of the lamp the handle is firmly held in place with the pressure spring.

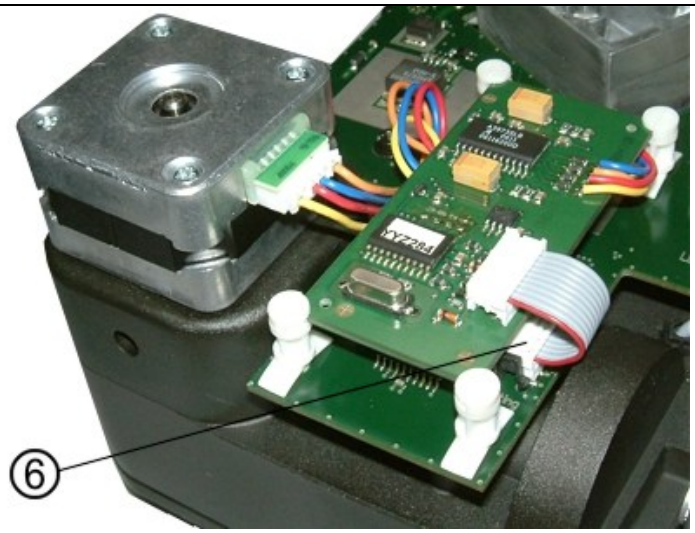
2 - The ON/OFF button is made of plastic.

3 - The barcode reader has only one connector cable to the main board. Thus the connector can be more easily accessed. In this case use Lumberg AZ30 tongs!



4 - The beam splitter mirror has been modified to facilitate service. A light shield cap was added to reduce of ambient light.

5 - The connector from the power supply board to the main board has been modified.



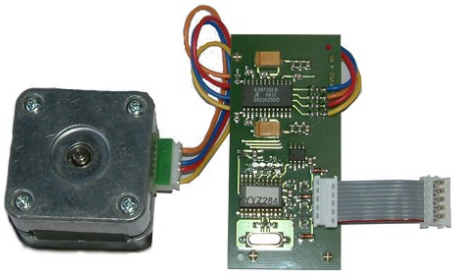
6 - The connector from the grating board to the main board has been modified.

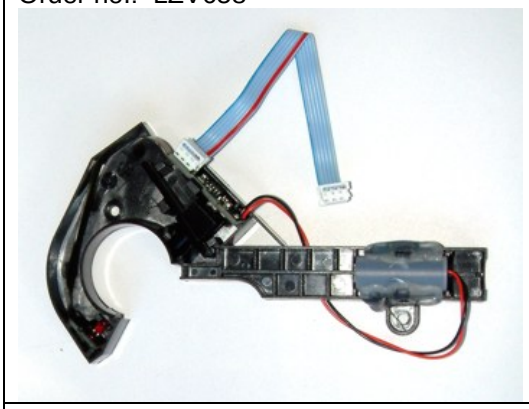
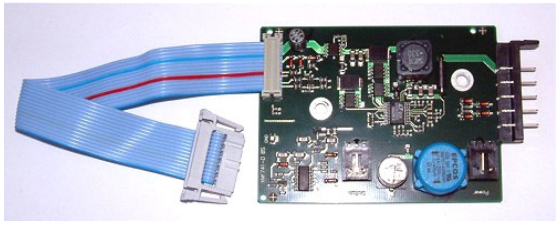
The result of these modifications is that the redesigned parts can no longer be used with the old DR 2800 and vice versa. For this reason new spare parts have been defined that can only be used with the new DR 2800 with article number LPG422.99.0001x.

Spare parts only for LPG422.99.0001x

Push button (Redesign)
Order no.: LZV756

Grating motor (Redesign)
Order no.: LZV753



Lamp Connector (Redesign) Order no.: LZV754 	**Beam splitter mirror (Redesign)** Order no.: LZV755
Barcode Reader (Redesign) Order no.: LZV658 	**Hall Sensor PCB (Redesign)** Order no.: YAB059
Power Supply PCB (Redesign) Order no.: YAB052 	**Microcomputer board (Redesign)** Order no.: YAB051

HACH LANGE GmbH Postfach 27 02 47 D-40525 Düsseldorf

Service Düsseldorf: J.Bongert, F.Willms, R.Heger
HLE ServiceSupport

Service Ames: T.Helgeson, D.Klein, M.Price, M.Miller

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volker.maue@hach-lange.de

Date
15. Dec 2006

Service Information

Bitte aktualisieren Sie Ihre Serviceunterlagen!
Please update your service manuals!

VAA608 – Software DR 5000 / DR 2800

Hallo Kollegen

Anbei das Softwarepaket VAA608 für das DR 2800 und DR 5000. Bitte die vorhandenen USB-Sticks VAA608 mit dem Inhalt der beigefügten Datei "VAA608.zip" überschreiben.

Es wurden Änderungen in folgenden Programmen durchgeführt:

Testprogramm DR 5000 Version 1.38

- Änderung im Hardwarecheck (Adjust) (Menü Inspection)
- Beim Abgleich der Rundküvettenerkennung wurde die Erkennungsschwelle (Küvette eingesetzt / nicht eingesetzt) von 15 auf 76 mV erhöht. Die Erkennung von Rundküvetten soll damit sicherer funktionieren.
- Der „Dark Current Adjust“ wird jetzt mit Hilfe des Karussells durchgeführt.

Wichtig: Dazu muss die Position 4 des Karussells, mit z.B. einem um 90° gedrehten Prüffilter, blockiert werden (siehe Position 1 in Bild/Picture 1)! Das Karussell bei der Aufforderung „Insert Carousel ‚VAA603’! Close Lid“ einsetzen. Das schwarze Optiktuch wird für den Abgleich nicht mehr benötigt.

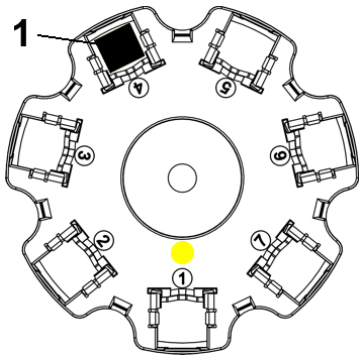

Bild / Picture 1

Testprogramm DR 2800 Version 0.92

- Änderung im Hardwarecheck (Adjust) (Menü Inspection)
- Beim Abgleich der Rundküvettenerkennung wird der LED-Pegel kontrolliert. Er muss zwischen 0,4 und 3,5 Volt liegen, ansonsten erfolgt eine Fehlermeldung. Die Erkennung von Rundküvetten soll damit sicherer funktionieren.

Die Anwenderprogramme DR 5000 Version 1.05 und DR 2800 Version 1.02 wurden nicht geändert.

Die Datei ist auch im Intranet www.hach-lange.net als Download verfügbar (Menü Service / Software).

Mit freundlichen Grüßen
Volker Maue

Dear colleagues

Attached you can find the software service package VAA608. Please extract the attached file "VAA608.zip" and copy / overwrite it on your USB memory stick VAA608.

We modified the programs:

Test program DR 5000 Version 1.38

- Modification of Hardwarecheck (Adjust) (Menu Inspection)
- During adjustment of the round cuvette the detection limit of the sensor was increased from 15 to 76 mV (round cuvette inserted / not inserted). The recognition of our barcode round cuvettes should now be more reliable.
- The „Dark Current Adjust“ will be executed with the carousel cell holder.

Important: The position 4 of the carousel cell holder has to be blocked with a 90° rotated optical test filter (see position 1 in Picture 1). Please insert the modified carousel cell holder if the message „Insert Carousel ‚VAA603'! Close Lid“ appears. The black cloth for the „Dark Current Adjust“ is no longer required.

Test program DR 2800 Version 0.92

- Modification of Hardwarecheck (Adjust) (Menu Inspection)
- During the adjustment of the round cuvette detection the sensor voltage of the LED beam will be checked. The detection limit should be between 0.4 and 3.5 Volt, otherwise an error message will appear. The recognition of our barcode round cuvettes should now be more reliable.

The operating systems of DR 5000 Version 1.05 and DR 2800 Version 1.02 have not been modified.

This file is also available on Intranet www.hach-lange.net as download (menu Service / Software).

Best regards
Volker Maue

Maue, Volker

Von: Maue, Volker

Gesendet: Dienstag, 27. Juni 2006 15:05

An: Bongert, Joachim; Willms, Frank; Heger, Rene; HLE Servicesupport; Price, Mark (HachAmes); Klein, Don; Miller, Matt; Helgeson, Tim

Cc: Maue, Volker

Betreff: Software Service Package VAA608 for DR 2800 / DR 5000

Hallo Kollegen

Anbei das Softwarepaket VAA608 für das DR 2800 und DR 5000. Bitte die vorhandenen USB-Sticks VAA608 mit dem Inhalt der beigefügten Datei "VAA608.zip" überschreiben.

Es wurden Änderungen in folgenden Programmen durchgeführt:
- Sprachdatei "lng.tar.gz" , Änderungen in Japanisch
- DR 2800: Lange und Hach Chemie Datenbank "dbhlc.tar.gz" - Version 53D / 28 , Änderungen in Japanisch
- DR 5000: Lange und Hach Chemie Datenbank "dbhl.tar.gz" - Version 53E / 05 , Änderungen in Japanisch
- DR 2800: Hinzufügen von Chemie Programmen für die Gerätevarianten für NALCO und GE (Betz)

Zum Updaten der Geräte während der Inspektion / Reparatur bitte die neuen Dateien benutzen!

Die Datei ist auch im Intranet www.hach-lange.net als Download verfügbar (Menü Service / Software).

Mit freundlichen Grüßen
Volker Maue

Dear Colleagues

Attached you can find the software service package VAA608. Please extract the attached file "VAA608.zip" and copy / overwrite it on your USB memory stick VAA608.

We modified the programs:
- language file "lng.tar.gz" , modifications in Japanese language
- DR 2800: Lange and Hach Chemistry database "dbhlc.tar.gz" - version 53D / 28, modifications in Japanese language
- DR 5000: Lange and Hach Chemistry database "dbhl.tar.gz" - version 53E / 05, modifications in Japanese language
- DR 2800: Implementation of chemistry programs for instrument types of NALCO and GE (Betz)

Please use during maintenance the attached file to upgrade the software of the DR 2800 and DR 5000!

This file is also available on Intranet www.hach-lange.net as download (menu Service / Software).

Best regards
Volker Maue

Maue, Volker

Von: Maue, Volker

Gesendet: Freitag, 28. April 2006 13:41

An: Bongert, Joachim; Willms, Frank; Heger, Rene; HLE Servicesupport; Price, Mark (HachAmes); Klein, Don; Miller, Matt; Helgeson, Tim

Betreff: Software Service Package VAA608 for DR 2800 / DR 5000

Hallo Kollegen

Anbei das Softwarepaket VAA608 für das DR 2800 und DR 5000. Bitte die vorhandenen USB-Sticks VAA608 mit dem Inhalt der beigefügten Datei "VAA608.zip" überschreiben.

Es wurden Änderungen in folgenden Programmen durchgeführt:
- Anwenderprogramm DR 2800 (Version 1.02) und DR 5000 (Version 1.05)
- USB-Treiberdatei
- Sprachdatei
- internes Testprogramm (zum Benutzen bitte VAA608 vor dem Einschalten des Gerätes einstecken)

Zusätzlich ist die "Service Inspection" im Testprogramm in "Field Service Inspection" (mit dem VAA591 Filtersatz) und "Service Center Inspection" (nur für Service Center mit den notwendigen Prüfmitteln) unterteilt worden.

Zum Updaten der Geräte während der Inspektion / Reparatur bitte die neuen Dateien benutzen!

Die Datei ist auch im Intranet www.hach-lange.net als Download verfügbar (Menü Service / Software).

Mit freundlichen Grüßen
Volker Maue

Dear Colleagues

Attached you can find the software service package VAA608. Please extract the attached file "VAA608.zip" and copy / overwrite it on your USB memory stick VAA608.

We modified the programs:
- operating system DR 2800 (version 1.02) and DR 5000 (version 1.05)
- USB driver file
- language file
- internal test program (to use it, plug in VAA608 before power on the instrument)

Additional the "Service Inspection" in the internal test program is divided in "Field Service Inspection" (with VAA591 filter set) and "Service Center Inspection" (only for service center with necessary tools).

Please use during maintenance the attached file to upgrade the software of the DR 2800 and DR 5000!

This file is also available on Intranet www.hach-lange.net as download (menu Service / Software).

Best regards
Volker Maue

Maue, Volker

Von: Maue, Volker

Gesendet: Mittwoch, 1. Februar 2006 16:02

An: Bongert, Joachim; Willms, Frank; Heger, Rene; Klein, Don; Miller, Matt; HLE Servicesupport; Rembges, Roberto

Betreff: DR 5000 / DR 2800 - Software Service VAA608

Hallo Kollegen

Anbei das Softwarepaket Service VAA608. Das Softwarepaket beinhaltet Anwenderprogramm, Testdaten, Sprachdatei, USB-Treiberdatei, Service Inspektions Programm für das DR 5000 (einschließlich Varianten DU 720 / DU 730) und DR 2800. Die Datei ist auch im Intranet www.hach-lange.net als Download verfügbar (Menü Service / Software).

Änderungen:
- Sollwerttabelle für die Service Inspektion
- Sprachdatei Version 2 - Änderungen in Schwedisch
- Chemie Testdaten Hach Lange 53D - DR 2800 Änderungen in Schwedisch

Achtung. Das Softwarepaket beinhaltet nicht das Linux - Kernelupdate!

Die derzeitig gültigen Softwareversionen sind:

DR 5000:

Anwenderprogramm	Version 1.04	Datei: ghl.gz
Chemie Testdaten	Hach Lange Version 53E / Hach Version 03	Datei: dbhl.tar.gz

DR 2800:

Anwenderprogramm	Version 1.01	Datei: dr2800.gz
Chemie Testdaten	Hach Lange Version 53D / Hach Version 26	Datei: dbhlc.tar.gz

DR 5000 + DR 2800:

Sprachdatei	Version 2	Datei: lng.tar.gz
USB-Treiber	Version 1	Datei: drv.tar.gz

Mit freundlichen Grüßen
Volker Maue

Dear Colleagues

Attached you can find a software package for service VAA608. This software package contains the Operating System, Procedures, Language file, USB driver file, Service inspection program of DR 5000 (including DU 720 / DU 730) and DR 2800. This file is also available on Intranet www.hach-lange.net as download (menu Service / Software).

Modifications:
- Nominal values of service inspection (optical validation)
- Language file version 2 - modifications in Swedish
- Procedures Hach Lange version 53E - DR 5000 modifications in Swedish

Note: This software package doesn't contain the Linux-Kernelupdate!

The software version of the current times are:

DR 5000:

Operating System	Version 1.04	file: ghl.gz

Procedures	Hach Lange Version 53E / Hach Version 03	file: dbhl.tar.gz
DR 2800:		
Operating System	Version 1.01	file: dr2800.gz
Procedures	Hach Lange Version 53D / Hach Version 26	file: dbhlc.tar.gz

DR 5000 + DR 2800:		
Language file	Version 2	file: lng.tar.gz
USB driver	Version 1	file: drv.tar.gz

Best regards
Volker Maue

Maue, Volker

Von: Maue, Volker
Gesendet: Donnerstag, 12. Januar 2006 13:58
An: Bongert, Joachim; Willms, Frank; Heger, Rene; Klein, Don; Miller, Matt; HLE Servicesupport
Betreff: DR 5000 / DR 2800 - Softwarepaket Service VAA608

Hallo Kollegen

Anbei das Softwarepaket Service VAA608. Das Softwarepaket beinhaltet Anwenderprogramm, Testdaten, Sprachdatei, USB-Treiberdatei, Service Inspektions Programm für das DR 5000 (einschließlich Varianten DU 720 / DU 730) und DR 2800. Die Datei ist auch im Intranet als Download verfügbaer (Menü Service / Software).

Achtung. Das Softwarepaket beinhaltet nicht das Linux - Kernelupdate!

Die derzeitig gültigen Softwareversionen sind:

DR 5000:
Anwenderprogramm Version 1.04 Datei: ghl.gz
Chemie Testdaten Hach Lange Version 53D / Hach Version 03 Datei: dbhl.tar.gz

DR 2800:
Anwenderprogramm Version 1.01 Datei: dr2800.gz
Chemie Testdaten Hach Lange Version 53D / Hach Version 26 Datei: dbhlc.tar.gz

DR 5000 + DR 2800:
Sprachdatei Version 1 Datei: lng.tar.gz
USB-Treiber Version 1 Datei: drv.tar.gz

Mit freundlichen Grüßen
Volker Maue

Dear Colleagues

Attached you can find a software package for service VAA608. This software package contains the Operating System, Procedures, Language file, USB driver file, Service inspection program of DR 5000 (including DU 720 / DU 730) and DR 2800. This file is also available on Intranet www.hach-lange.net as download (menu Service / Software).

Note: This software package doesn't contain the Linux-Kernelupdate!

The software version of the current times are:

DR 5000:
Operating System Version 1.04 file: ghl.gz
Procedures Hach Lange Version 53D / Hach Version 03 file: dbhl.tar.gz
DR 2800:
Operating System Version 1.01 file: dr2800.gz
Procedures Hach Lange Version 53D / Hach Version 26 file: dbhlc.tar.gz

DR 5000 + DR 2800:
Language file Version 1 file: lng.tar.gz
USB driver Version 1 file: drv.tar.gz

Best regards
Volker Maue

Maue, Volker

Von: Maue, Volker
Gesendet: Donnerstag, 12. Januar 2006 14:28
An: Bongert, Joachim; Heger, Rene; Willms, Frank; Klein, Don; Miller, Matt; HLE Servicesupport
Betreff: DR 5000 + DR 2800 Linux-Kernelupdate

Hallo Kollegen

Anbei die neueste Version 7B-33 des Linux-Kernelupdates. Bitte beachtet, dass es für das DR 5000 und DR 2800 jeweils unterschiedliche Dateien gibt. Die Version des Kernels (33) wurde zwar nicht geändert, doch dafür verschiedene Start- und Scriptdateien, die auch in diesem Update enthalten sind.

Diese Dateien sind auch im Intranet www.hach-lange.net im Menü Service / Software verfügbar.

Mit freundlichen Grüßen
Volker Maue

Dear Colleagues

Attached you can find latest versions 7B-33 of Linux-Kernelupdate. Please note, that for DR 5000 and DR 2800 different files exist. We don't modify the Linux-Kernel itself, but we modified start and script files, which are also included in this update.

This files are also available on our intranet www.hach-lange.net menu Service / Software.

Best regards
Volker Maue

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1 General

The DR2800 Spectrophotometer is a single beam photometer with a reference beam. It can be used to carry out measurements in the wavelength range from 340 nm - 900 nm. It has an optical grating for wavelength selection and two silicon photovoltaic cells as detectors.

The photometer is operated with the help of a touchscreen. The (labelled) keys are displayed on the screen. They are activated by touching them. When a key is activated, it is highlighted and the corresponding command is carried out.

The DR2800 is a protection class II device with ingress protection rating IP41 (with closed lid) or IP42 (with protective cover in place).

1.1 Instrument versions

The following models of the DR 2800 Spectrophotometer are available:

- LPG422.99.00001 DR 2800 HACH LANGE
- LPG422.99.00002 DR 2800 HACH
- LPG422.99.00003 DR 2800 Betz
- LPG422.99.00004 DR 2800 Nalco
- LPG422.99.00011 DR 2800 HACH LANGE EMC Redesign
- LPG422.99.00012 DR 2800 HACH EMC Redesign
- LPG422.99.00013 DR 2800 Betz EMC Redesign
- LPG422.99.00014 DR 2800 Nalco EMC Redesign

1.2 Technical data

Type:	Grating spectrophotometer with reference beam. Readings are shown on a backlit graphic display with a touchscreen, which is used to operate the spectrophotometer.
Operating Mode:	Transmittance (%), absorbance and concentration
Light sources:	Halogen lamp
Wavelength range:	340 nm – 900 nm
Wavelength resolution:	1 nm
Wavelength calibration:	Automatic
Wavelength selection:	Automatic, depending on the selected test method
Wavelength accuracy:	± 1.5 nm in the wavelength range 340 nm - 900 nm
Wavelength reproducibility:	< 0.1 nm
Photometric accuracy:	5 mAbs at 0.0 – 0.5 Abs; 1% at 0.50 – 2.0 Abs
Photometric linearity:	< 0.5% al 2 Abs or less; ≤ 1% at > 2 Abs with neutral glass at 546 nm
Spectral width:	< 8 nm
Stray light:	< 0.2% T at 340 nm with KV450/3 < 0.1 % T at 340 nm with NaNO2
Operating system:	Linux
Ports:	Use shielded cable only, with max. length of 3 m

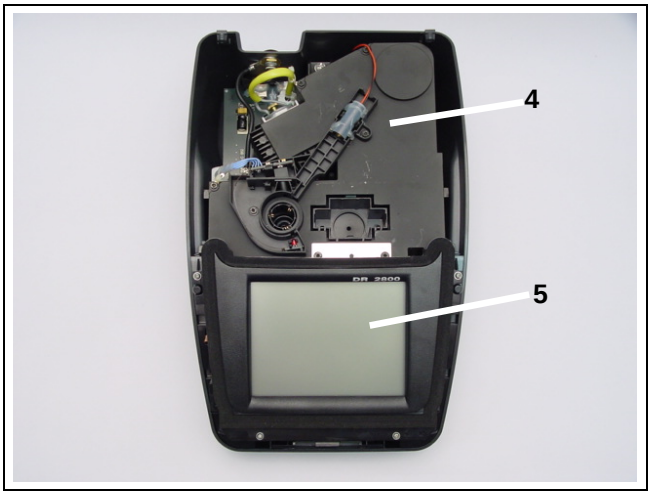
	1 USB port for PC 1 USB 1.1 port for printer, keyboard or USB memory stick
Power requirements:	15 V DC/30 VA
Protection rating:	IP41 with closed lid IP42 with protective cover in place
Protection class:	Protection class II
Operating conditions:	10°C - 40°C (50°F - 104°F); max. 80% rel. humidity (no condensation)
Storage conditions:	-40°C - 60°C (-40°F - 140°F); max. 80% rel. humidity (no condensation)
Dimensions:	Width: 220 mm (8.6 in) Height: 135 mm (5.3 in) Depth: 330 mm (12.9 in)
Weight:	4.06 kg (8.95 lbs) without battery 4.38 kg (9.66 lbs) with battery
Warranty:	2 years (up to 5 years if an inspection agreement is concluded)

1.3 Location of components in the spectrophotometer

1 - Housing top, complete (LZV588/589)

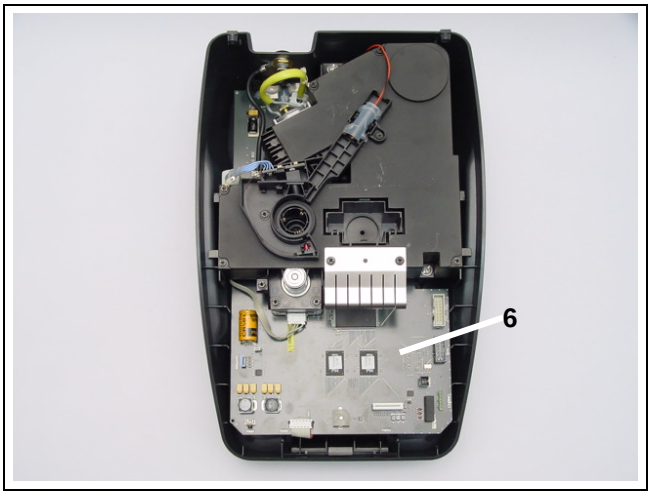
2 - Casting resin nameplate (LZV597/598)

3 - 50 mm cell compartment with light shield inserted (LZV646)

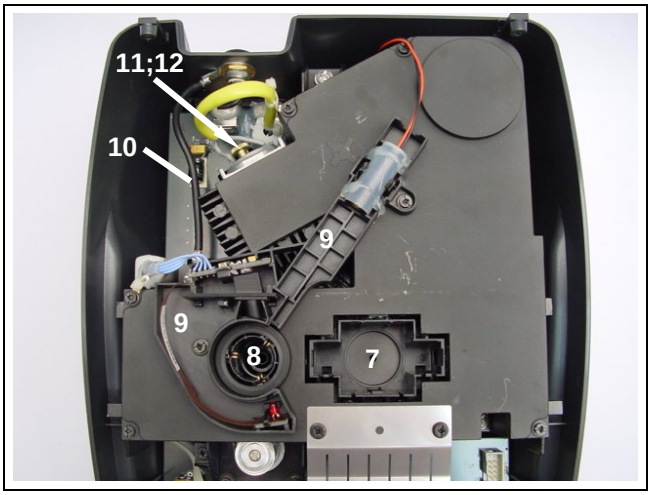


4 - Beam path

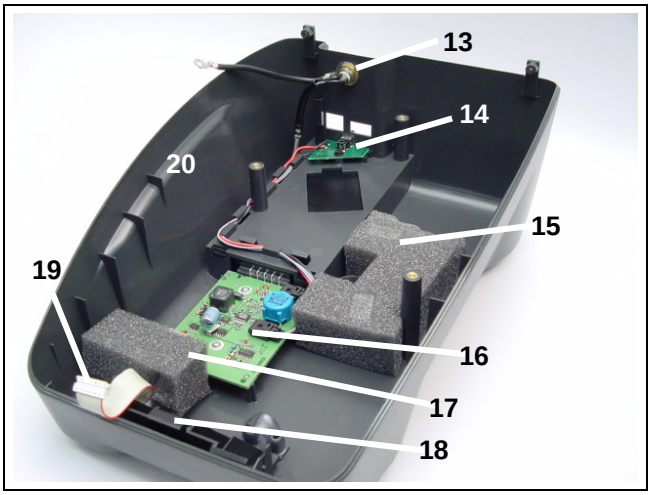
5 - Display assembly



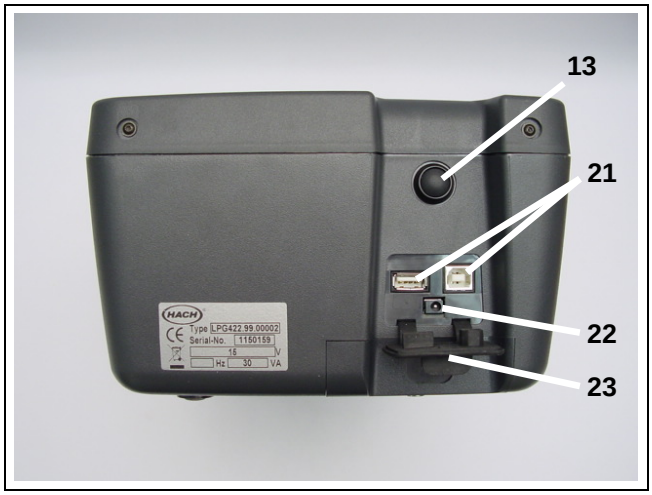
6 - Microprocessor board (YAB077/YAB051)



7 - 50 mm cell compartment (LZV600)
8 - Round cell compartment (LZV599)
9 - Barcode reader unit
10 - Earth connection (ZCA863)
11 - Halogen projection lamp (LZV565)
12 - Lamp socket board (YAB081)



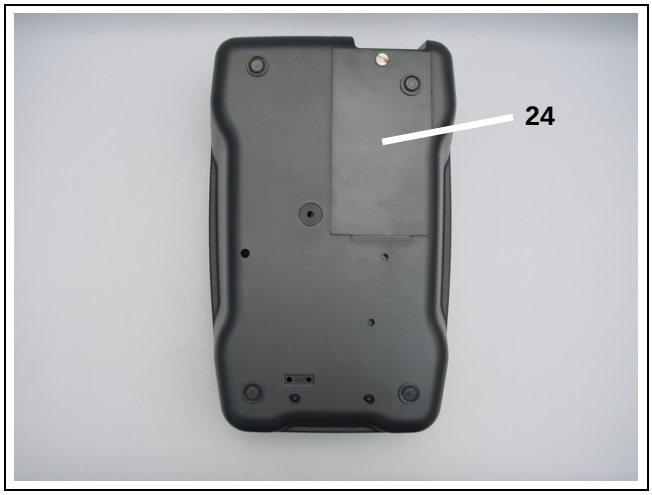
13 - I/O push button (LZV613)
14 - Plug-in power supply board (YAB082)
15 - Buffer (HYP405)
16 - Battery power supply board (YAB078)
17 - Buffer (HYP404)
18 - Catch (LZV604)
19 - 12-pin connector, micromodule (ZCA851)
20 - Housing bottom (LZV596)



21 - USB ports

22 - Power socket

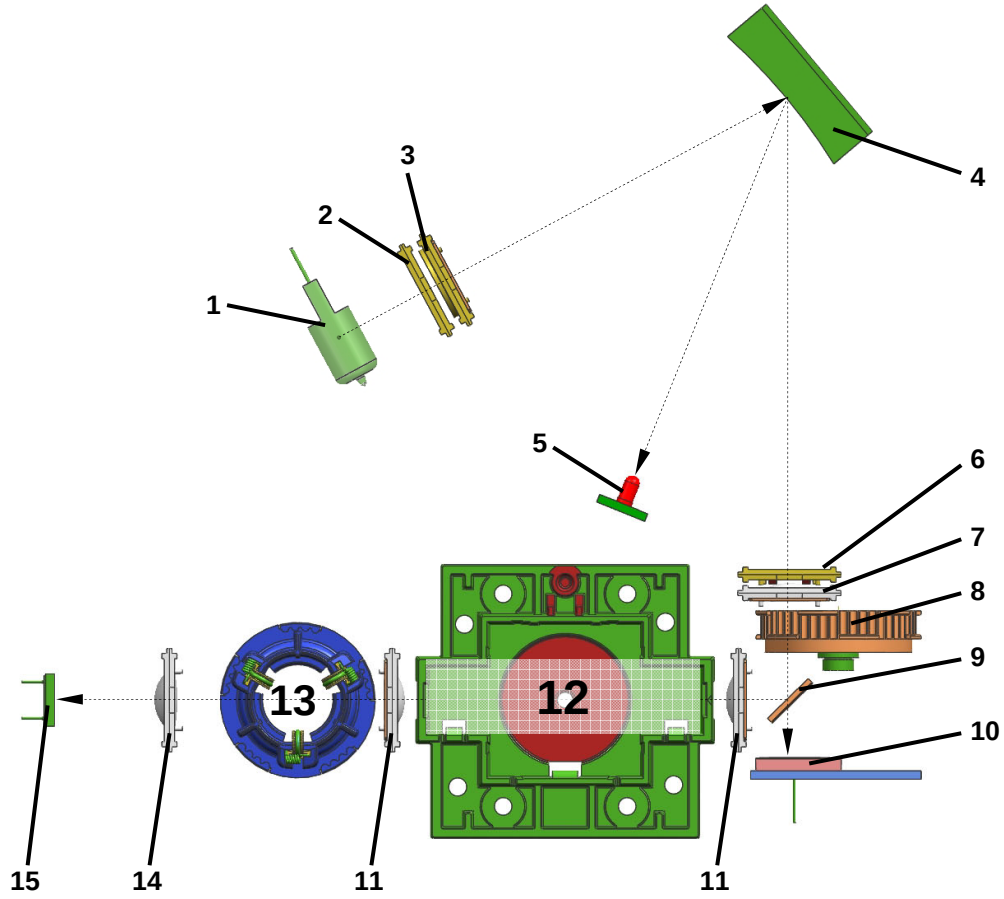
23 - Cap for USB ports (LZV607)



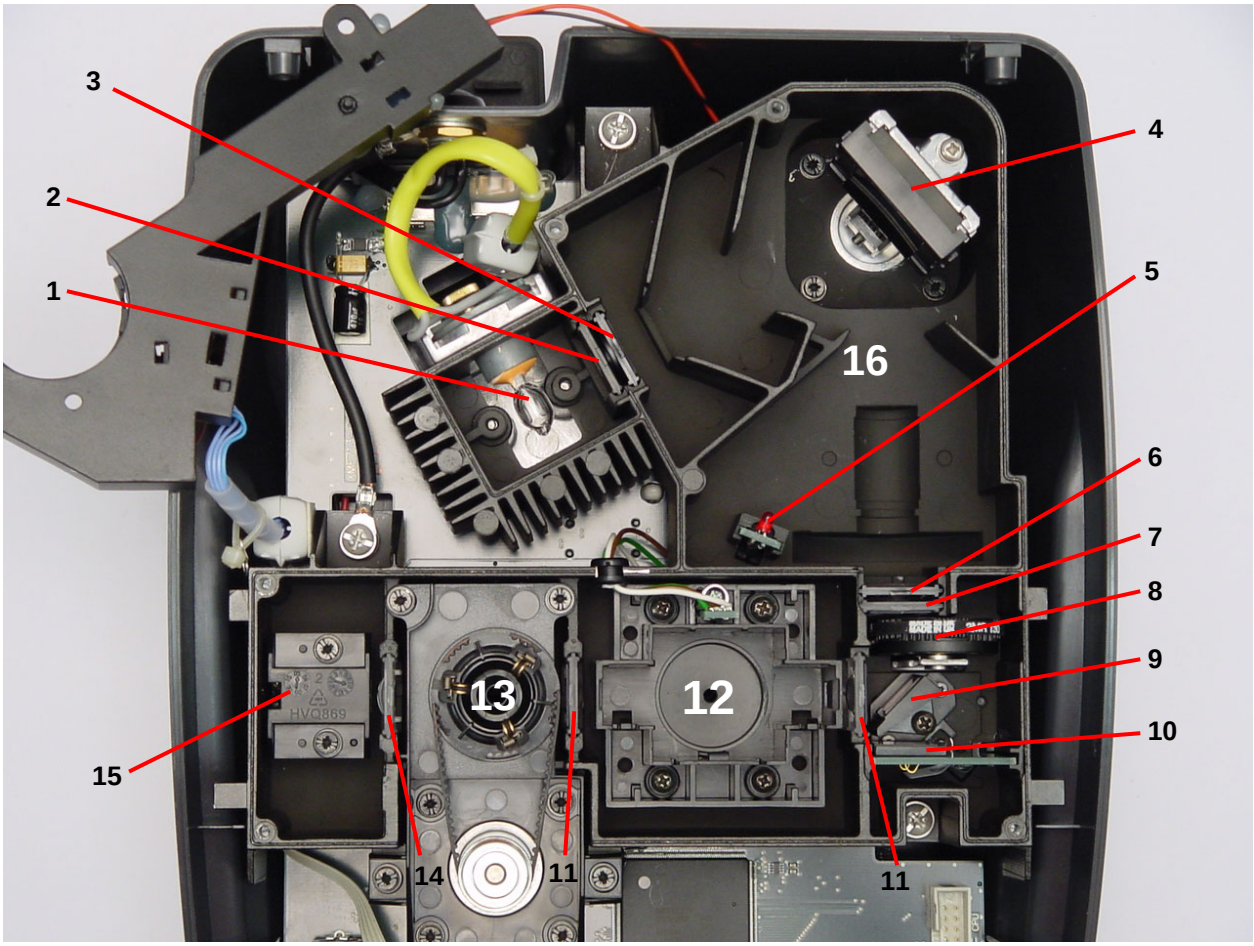
24 - Battery cover (LZV595)

1.4 Location of components in beam path

Schematic diagram of the beam path



1 - Halogen projection lamp (LZV565)
2 - Lamp aperture plate
3 - KG2 glass holder, complete
4 - Concave grating (LZV592)
5 - LED board (ZBA830)
6 - Slit holder, complete
7 - Lens B (included in LZV587)
8 - Filter wheel with filters (LZV591)
9 - Beam splitter mirror, mounted (LZV590)
10 - Reference board (YAB083)
11 - Lens A (included in LZV587)
12 - 50 mm cell compartment (LZV600)
13 - Round cell compartment (LZV599)
14 - Lens C (included in LZV587)
15 - Measurement sensor (LZV612)



1	-	Halogen projection lamp (LZV565)	10	-	Reference board (YAB083)
2	-	Lamp aperture plate	11	-	Lens A (included in LZV587)
3	-	KG2 glass holder, complete	12	-	50 mm cell compartment (LZV600)
4	-	Concave grating (LZV592)	13	-	Round cell compartment (LZV599)
5	-	LED board (ZBA830)	14	-	Lens C (included in LZV587)
6	-	Slit holder, complete	15	-	Measurement sensor (LZV612)
7	-	Lens B (included in LZV587)	16	-	Frame bottom
8	-	Filter wheel with filters (LZV591)			
9	-	Beam splitter mirror, mounted (LZV590)			

2 Error messages

The error messages listed here supplement the error messages in the User Manual. The selfcheck error messages are always in English.

Message		**[Hardware error]**
1	Information	The microprocessor board and the grating motor board are not connected.
	Check	Check connection cable.
2	Information	I2C communication with the controller of the grating motor board is defective.
	Check	Check whether the communication with the controller is working. Test program: Option → About → Versions Information/not available (see section 3.9.2 About)
3	Information	I2C communication with the controller on the microprocessor board for the filter motor/barcode motor is defective.
	Check	Check whether communication with the controller functions properly. Test program: Option → About → Versions Information/not available (see section 3.9.2 About)

Message			**[Selfcheck stopped] [Please close lid] [Please check the lamp]**
1	Information		If the sample compartment lid is open, strong light (sunlight) can interfere with the calibration of the photometer.
	Check		Close the lid and touch the 'Start Again' 'key on the display.
2	Information		When calibration errors occur in the user program, it is advisable to switch to the test program and repeat the calibration. Test program: Photometer → Grating → Calibration (see section 3.7.4 Grating). Error messages about the measured reference voltages are displayed here.
3	Information		While the calibration proceeds, observe where the error message occurs.
4	Information		The zero order of the halogen lamp is detected by the zero order LED. Turning the grating moves the reflection of the white light over the LED zero order.
	Check	1	Check whether the grating motor moves.
		2	Check whether the lamp is switched on.
		3	Check whether the LED is connected to the circuit board and is facing the grating.
5	Information		The filter wheel is rotated through 360° and the maximum signal (position of filter 2) is sought. Filter 2 (green) is then brought into position.
	Check		Check whether the filter motor moves. Test program: Photometer → Adjust → Filter (see section 3.7.5 Adjust)
6	Information		Filter 2 is scanned and the centre position of the filter is determined.
	Check		Check whether the filter motor can be moved easily at every position.

7	Information		Searching for the zero order of the grating – Searching for the reflection of the white light of the lamp on the reference photovoltaic cell: the grating motor rotates the grating once around its axis. The reference signal must change from approx. 0 V to approx. 5 V (see measurement diagram in the test program).
	Check	1	Check whether the grating motor moves. Test program: Photometer → Adjust → Grating (see section 3.7.5 Adjust)
		2	Check whether the measurement system (preamplifier/AD converter) functions. Test program: Photometer → AD → Lamp (switch On/Off) (see section 3.7.2 AD).
8	**Information**		Repeated scan of the zero order with higher resolution to define the start value for the grating position.
	Check		Check whether beam path is blacked out (no background light).
9	**Information**		Move grating to 560nm position
	Check		Check whether green light is visible in the cell compartment (hold a sheet of white paper in the beam path).
10	**Information**		The reference photovoltaic cell is defective or not connected to the microprocessor board.
	Check		Check the plug on the microprocessor board and replace the reference photovoltaic cell if necessary.

Message		**[Selfcheck stopped] [Please remove cuvette] [Please close lid]**
1	Information	After a calibration, an air reading is carried out at 560 nm and compared with the air values stored in the photometer before it left the factory. The error message appears if there is a difference of more than > 10 mAbs.
	Check	Check that the beam path in the cell compartment is unobstructed. The measurement cell should receive maximum light. Make sure that the light shield and cell adapter are correctly positioned. Take cuvettes out of the beam path.

Message		**[It's recommended to execute a Full System Check] [Please remove cuvette] [Please close lid]**
1	Information	After the first air reading is carried out at 560 nm, a second air reading is carried out and compared with the air values stored in the photometer before it left the factory. The error message appears if there is a difference of more than > 4 mAbs. When the Start key is pressed, a new air reading is carried out and the factory values are overwritten.
	Check	Check that the beam path in the cell compartment is unobstructed. The measurement cell should receive maximum light. Make sure that the light shield and cell adapter are correctly positioned. Take cuvettes out of the beam path.

Message	**[Absorbance > 3.5]**
Information	The absorbance value is greater than 3.5
Check	Check whether the measurement system is functioning. Test program: Photometer → AD → Abs/Ratio/Sample/Reference (see section 3.7.2 AD)

Message	**[Clean cuvette]**

Information		There were several outliers in the 10 measurements made during the rotation of the cuvette
Check	1	Check whether the cuvette rotates.
	2	Check whether the measurement system functions properly. Test program: Photometer->AD->Abs/Ratio/Sample/Reference (see section 3.7.2 AD)

Message		**[Concentration too high!]**
Message		**[Under measuring range]**
Message		**[Over measuring range]**
Message		**[Negative result!]**
Information		The conversion of the absorbance to the corresponding concentration does not give a value in the expected order of magnitude.
Check	1	Check whether the measurement system functions properly. Test program: Photometer->AD->Abs/Ratio/Sample/Reference (see section 3.7.2 AD)
	2	Check whether the correct test databases (software) are installed.

Message		**[No evaluation!]**
Information		At least one of the equations for calculating the corresponding concentration is wrong.
Check	1	Check whether the correct test databases (software) are installed.
	2	In the case of a user program: Check whether correct equations and variables were entered.

3 Test program

3.1 General

The test program can be used to modify settings and test the correct functioning of the spectrophotometer. Some of the test programs contain functions that are intended only for use by the development and production departments. Where this is the case, it is indicated in the program description.

The test program contains menus to guide the user to the individual program options. When the test program is running, the menu is shown on the left side of the display. The right side of the display is the output window, in which status information and/or messages are shown. The full menu path is always shown in the title line at the top of the display. The Return key is at the bottom right of the display.

3.2 Selecting a language

When you switch on the DR 2800, touch the appropriate keys on the screen until the language selection window appears. Select the language you want and confirm it by touching the ‘OK’ key. The DR 2800 then starts the calibration.

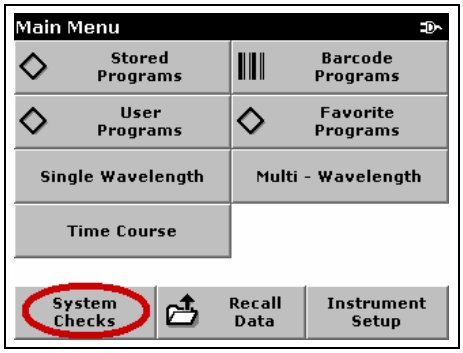
3.3 Password

Access to the programs of the DR2800 can be protected by a password (see the Password section of the DR2800 User Manual).

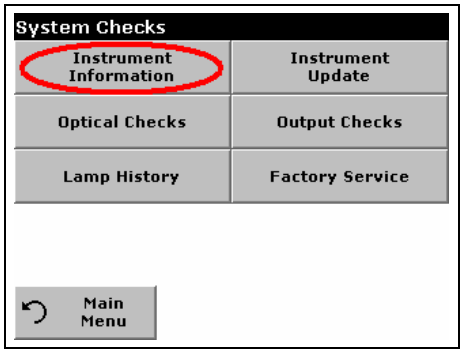
In an emergency (e.g. if you cannot remember the password) you can gain access with the help of a universal password:

Universal password: GAMMA

3.4 Instrument information

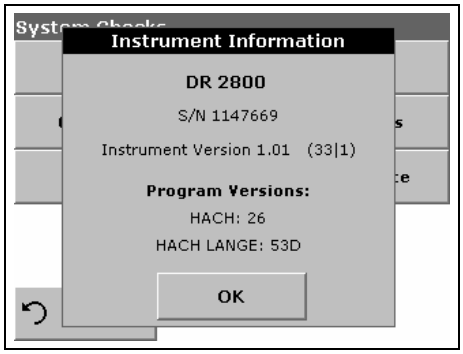


Touch the ‘System Checks’ key.



Touch the ‘Instrument Information’ key.

You can return to the main menu of the user program by touching the ‘Main Menu’ key.



The instrument version is displayed.

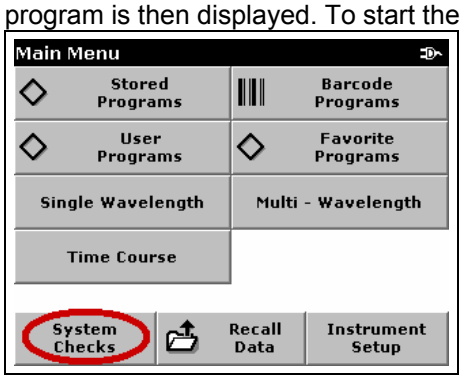
You can go back to the ‘System Checks’ menu by touching the ‘OK’ key.

Explanation of the fields in the ‘Instrument Version’ window:

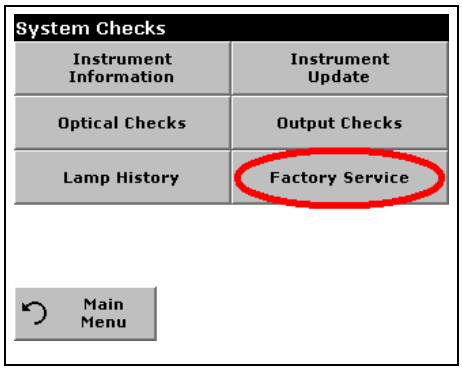
Menu item	Explanation
DR2800	Instrument name
S/N xxxxxxx	Instrument number
Instrument Version x.xx (xxIx)	Version number of the installed software (kernel version | USB driver version)
Program Version: HACH: xx HACH LANGE: xxx	Name and version of the installed database

3.5 Factory Service

After the spectrophotometer is switched on, it carries out a self check. The main menu of the user program is then displayed. To start the test program, proceed as follows:

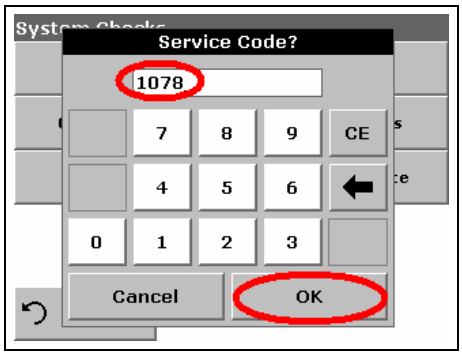


Touch the ‘System Checks’ key.

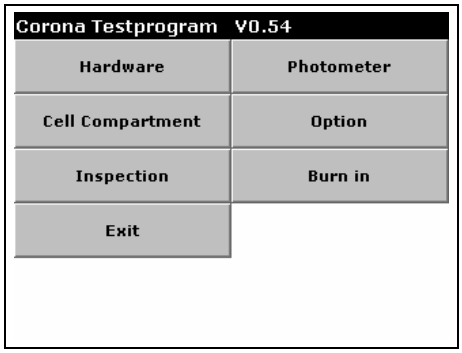


Touch the ‘Factory Service’ key.

You can return to the main menu of the user program by touching the ‘Main Menu’ key.



Enter the Service Code ‘**1078**’ and confirm by touching the ‘OK’ key.



The test program menu is now shown in the display. The name and version of the test program are shown in the title line at the top.

You can return to the user program by touching the ‘Exit’ key.

The table below contains the items shown in the main menu of the test program, with a brief description of their functions. A more detailed description is included in the following sections.

Menu item	Explanation
Hardware	Calls the test programs for the hardware (but not the beam path) of the DR2800. (See section 3.6 Hardware)
Photometer	Calls the test programs for the beam path. (See section 3.7 Photometer)
Cell Compartment	Calls the test programs for the barcode. (See section 3.8 Cell Compartment/Barcode)
Option	Various special test programs/settings. (See section 3.9 Option)
Inspection	Final inspection, service inspection, DR2800 hardware inspection, etc. (See section 3.10 Inspection)
Burn in	**CAUTION – For** use by the development and production departments only!
Exit	Go back to the user program.

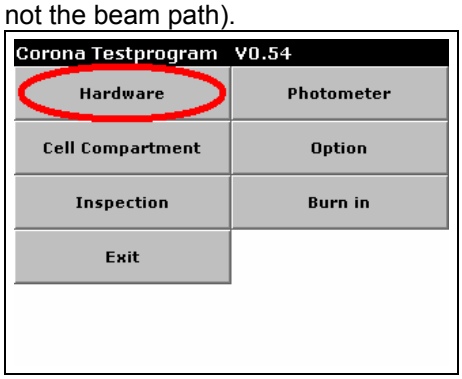
Please note: Some of the functions in the test program are intended only for use by the development and production departments. Where this is the case, it is indicated in the corresponding text passages!

Note: The current test program is also on the VAA608 (USB memory stick with programs). To start the test program from the VAA608, plug it into the switched-off DR2800 and then switch the instrument on. The test program then appears instead of the user program when the instrument starts.

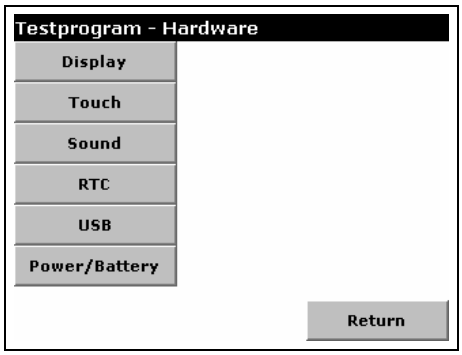
3.6 Hardware

3.6.1 General

The ‘Hardware’ menu of the DR2800 is used to call up test programs and settings for the hardware (but not the beam path).



Touch the ‘Hardware’ key in the test program main menu.



The menu ‘Test program - Hardware’ is displayed.

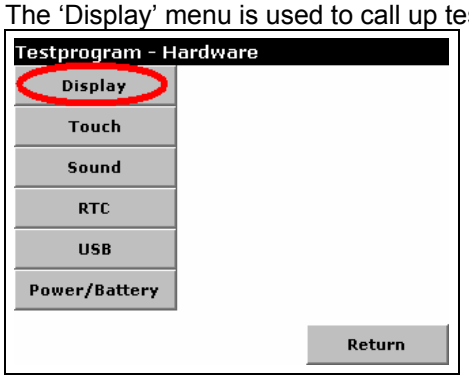
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

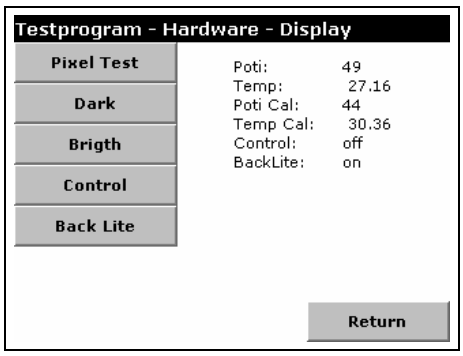
Menu item	Explanation
Display	Settings and tests for the display. (See section 3.6.2 Display)
Touch	Test and adjust the touchscreen. (See section 3.6.3 Touch)
Sound	Setting the signal tones. **CAUTION** – For use by the development and production departments only!
RTC	Setting the date and time. (See section 3.6.4 RTC)
USB	Testing the USB connectors. (See section 3.6.5 USB)
Power/Battery	Power supply options. (See section 3.6.6 Power/Battery)
Return	Return to previous menu.

3.6.2 Display

The ‘Display’ menu is used to call up test programs and settings for the display.



Touch the ‘Display’ key in the ‘Test program - Hardware’ menu.



The ‘Test program - Hardware - Display’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Pixel Test	The display slowly turns black and then white again. You can check visually whether all the pixels of the LCD function properly. When the test is finished, you can go back to the menu ‘Test program - Hardware – Display’ by touching the ‘Return’ key.
Dark	The LCD becomes darker. [1)]
Bright	The LCD becomes brighter. [1)]
Control	The brightness of the display changes as the temperature changes. A program therefore regulates the brightness in line with the measured display temperature. The LCD temperature regulation can be switched on and off by touching the ‘Control’ key. In the user program, the temperature regulation runs continuously in the background.
Back Lite	Switches the backlighting of the LCD on or off.

[1)] The ‘Dark’ and ‘Bright’ keys respond immediately. They are provided with a repeat function.

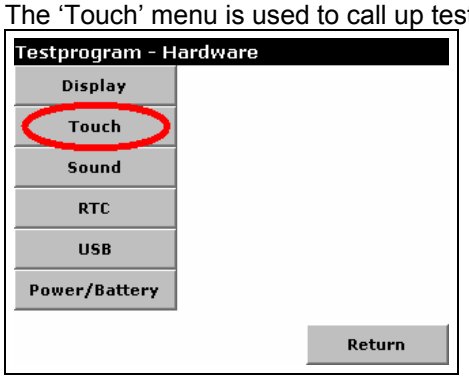
Explanation of the items in the window:

Display	Explanation
Poti:	Shows the current status of the contrast potentiometer.
Temp:	Shows the current temperature of the display.
Poti Cal:	Shows the contrast potentiometer value in the stored calibration values.
Temp Cal:	Shows the display temperature value in the stored calibration values.

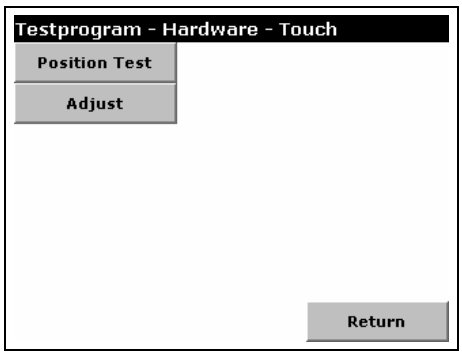
Display	Explanation
Control:	“On” or “off” is displayed (switches the LCD temperature regulation on or off)
Back Lite:	“On” or “off” is displayed (switches the LCD-backlighting on or off)

3.6.3 Touch

The ‘Touch’ menu is used to call up test programs and settings for the touchscreen.



Touch the ‘Touch’ key in the ‘Test program - Hardware’ menu.



The ‘Test program - Hardware - Touch’ menu is displayed.

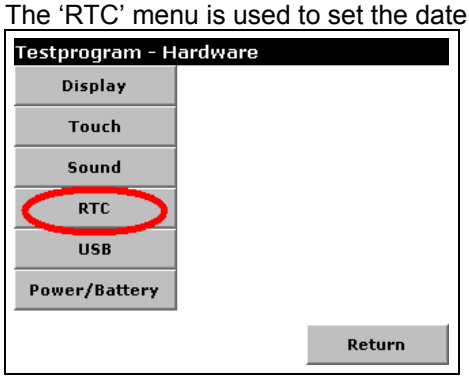
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

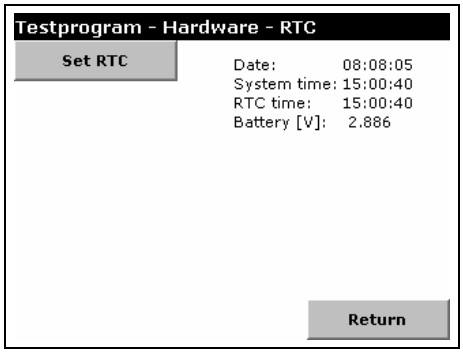
Menu item	Explanation
Position Test	A cross is drawn at the point where the screen is touched. The associated AD converter value is shown in the top left corner (0..1024).
Adjust	5 crosses are drawn in succession, which must be touched as accurately as possible. In this way each touchscreen is individually calibrated. Each touch is acknowledged with an acoustic signal.

3.6.4 RTC (Real Time Clock)

The ‘RTC’ menu is used to set the date and time.



Touch the ‘RTC’ key in the ‘Test program - Hardware’ menu.



The ‘Test program - Hardware - RTC’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

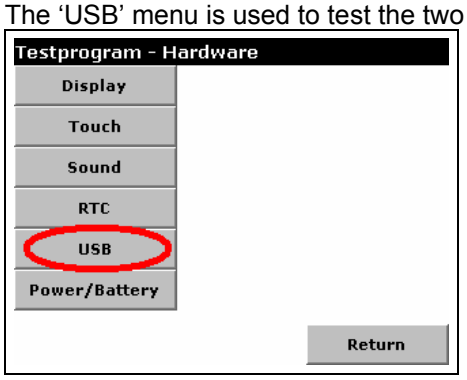
Menu item	Explanation
Set RTC	Opens the input window for the date and time.

Explanation of the items in the window:

Display	Explanation
Date:	Date
System time:	Time according to the processor
RTC time:	Time according to the real time clock module
Battery:	Shows the approximate voltage of the internal lithium battery. The battery stores the date and time securely when the photometer is switched off. ***Note:*** The displayed voltage is slightly lower than the actual battery voltage, but should not be less than 2.85 V. The voltage measured (with a voltmeter) should not be less than 3 V.

3.6.5 USB

The ‘USB’ menu is used to test the two USB connections.



Note: A USB memory stick (VAA608) and a type St(A)–St(B) USB cable are needed for the USB test.

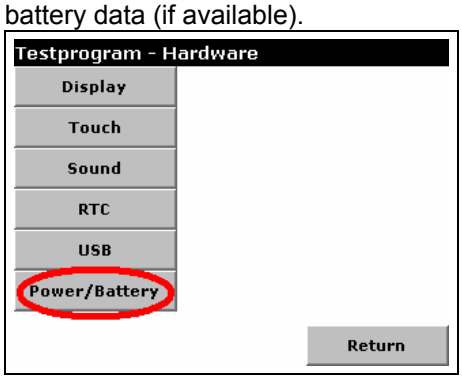
Touch the ‘USB’ key in the ‘Test program - Hardware’ menu to test the USB connections.

The program prompts you to plug in the USB memory stick (VAA608) first and then the USB cable.

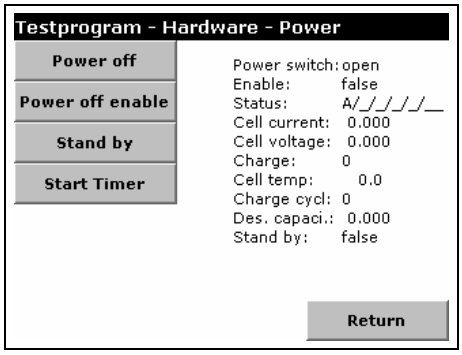
You can go back to the previous menu by touching the ‘Return’ key.

3.6.6 Power/Battery

The ‘Power/Battery’ menu is used to enter settings for the photometer’s power supply and verify the battery data (if available).



Touch the Power/Battery key in the ‘Test program – Hardware’ menu.



The ‘Test program - Hardware - Power/Battery’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Power off	The instrument is switched off.
Power off enabled	**CAUTION** – For use by the development and production departments only!
Stand by	The standby mode enables you to economise on power when in battery mode. Touching the key switches activates or deactivates the standby mode. In standby mode the backlighting is switched off and the grating motor is current-free. When the ‘Standby mode’ key is touched again, the backlighting is switched on and current is supplied to the grating motor, which returns to its original position.
Start timer	Starts the timer for switching the photometer off. It switches off after 15 min. The time is counted down in seconds under ‘Enable’.

Explanation of the items in the window:

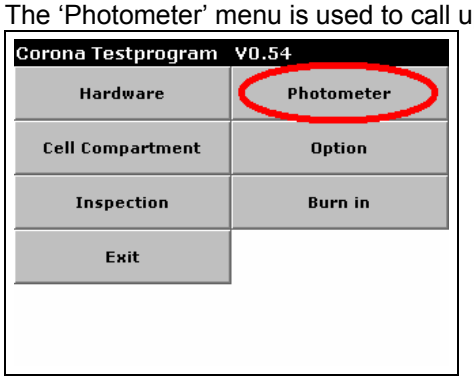
Display	Explanation
Power switch:	**CAUTION** – For use by the development and production departments only!
Enable:	**CAUTION** – For use by the development and production departments only!
Status:	A/B/D/C/F/FD If a letter is displayed it is set (active). If it is inactive, an underscore character is displayed in its place. The significance of the letters is as follows: A : Power unit detected B : Battery detected D : Battery discharging C : Battery charging F : Battery is fully charged FD : Battery is completely discharged
Cell current:	The current in the battery (Battery charging = positive current) or from the battery (Battery discharging = negative current) [1)]
Cell voltage:	Battery voltage [1)]
Charge:	Charge status of the battery (percentage) [1)]
Cell temp:	Temperature of the battery [1)]
Charge cycl.:	Number of charging cycles of the battery [1)] The estimated lifetime of the battery is about 500 charging cycles. If the operating time with the battery is then too low, the battery should be replaced.
Des. Capaci.:	Nominal capacity of the battery in Ah [1)]
Stand by:	Display: true/false The standby mode enables you to economise on power when in battery mode. The Standby mode key activates and deactivates the standby mode. In standby mode the backlighting is switched off and the grating motor is current-free. When the 'Standby mode' key is touched again, the backlighting is switched on and current is supplied to the grating motor, which returns to its original position.

[1)] These values are set to zero when there is no battery in the photometer.

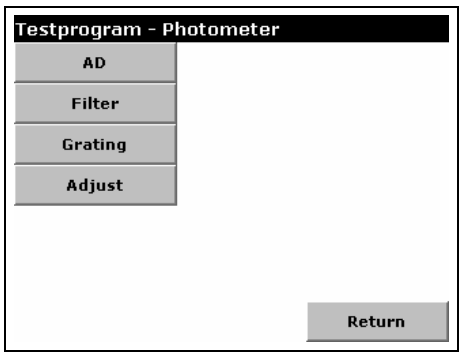
3.7 Photometer

3.7.1 General

The ‘Photometer’ menu is used to call up test programs and settings for the beam path.



Touch the ‘Photometer’ key in the main menu of the test program.



The menu ‘Test program - Photometer’ is displayed.

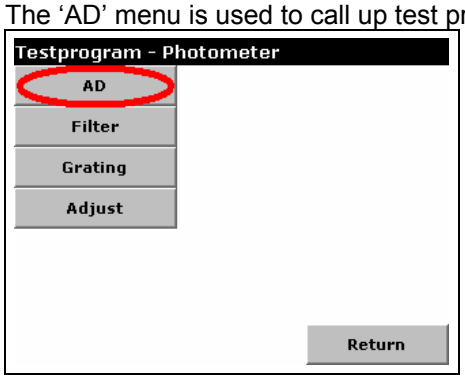
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

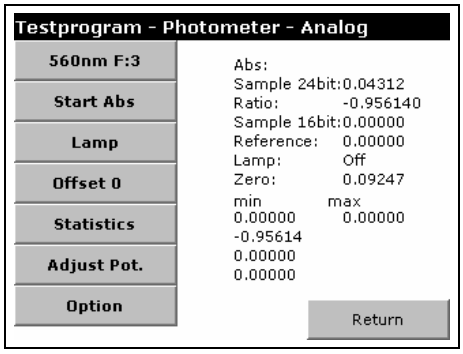
Menu item	Explanation
AD	Calls up test programs and settings for the grating and optical filters (see section 3.7.2 AD)
Filter	Calls up test programs and settings for the optical filter (see section 3.7.3 Filter)
Grating	Calls up test programs and settings for the grating (see section 3.7.4 Grating)
Adjust	Calls up options for setting the grating and the optical filter when the beam path is being adjusted (see section 3.7.5 Adjust)
Grubbs Test	**CAUTION –** This program is for use by the development and production departments only and will not be available from program version V 0.72 onward!

3.7.2 AD

The ‘AD’ menu is used to call up test programs and settings for the grating and the optical filter.



Touch the ‘AD’ key in the ‘Test program – Photometer’ menu.



The ‘Test program - Photometer – Analog’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Calibration 560nm F:3	Calibrates the photometer (grating and filters). If the calibration has already been carried out, a window opens to allow a wavelength to be entered. Enter the required wavelength and confirm it by touching the ‘OK’ key. The wavelength is then set (grating and filter) and displayed in the key. The text in the key might then be, for example, ‘560nm F:3’ (560nm = the set wavelength; F:3 = the filter position).
Start Abs	The DR2800 can also perform measurements when the sample compartment is open. The dark value (the value measured when the lamp is off) is therefore subtracted from the actual measured value (the value measured when the lamp is on). The measurements are taken in a given chronological sequence. When this key is touched, a measuring cycle is initiated (lamp on, measure, lamp off, measure). The result is displayed as an absorbance value in the output field ‘Abs.:’.
Lamp	The lamp is switched on and off by touching this key. During normal operation, the lamp in the DR2800 is switched off. **CAUTION:** If the lamp is left on for a long period of time, the frame of the DR2800 becomes very hot!
Offset 0 Offset x.xx	The actual measured value becomes the offset value. The text changes to ‘Offset x.xx’. The offset value is reset to zero by touching the key again. The text changes back to ‘Offset 0’.
Statistics	The min/max values of the analogue values are displayed in the same sequence as the analogue values themselves. The min/max values are reset by touching the key again.
Adjust Pot.	The amplification of the measurement channel and the

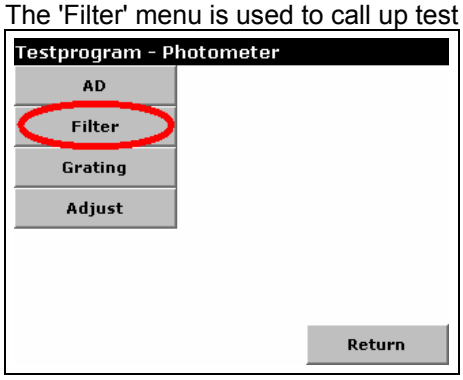
Menu item	Explanation
	amplification of the reference channel are set at a defined ratio to each other.
Option	**CAUTION** – For use by the development and production departments only!

Explanation of the items in the window:

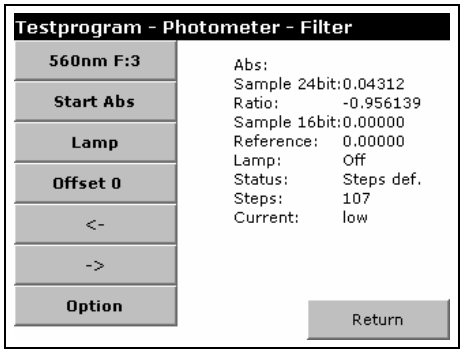
Display	Explanation
Abs:	The measured absorbance.
Sample 24bit:	Measurement channel in V (calculated from ratio).
Ratio:	The ratio of the measurement signal to 4.096V (output of the 24-bit converter). When the measurement signal = ½ of the reference signal, the ratio 1 is reached. A larger measurement signal triggers an error message. When the measurement signal = -½ of the reference signal, the ratio -1 is reached. A smaller measurement signal triggers an error message. In the DR2800 hardware, the signals are linked so that the measurement signal remains in the range between 0 and 1 times the reference signal (ratio -1 to +1). This ratio is the basis for the transmittance.
Sample 16bit:	The measurement channel in V. Measurements with a 16-bit converter.
Reference:	The value of the reference signal in V. Measurements with a 16-bit converter.
Lamp:	Status of the lamp (‘on/off’).
Zero:	Shows the measured value obtained by carrying out an air reading at the set wavelength (saved air value). This is checked at 560 nm as part of the self check each time the photometer is switched on.
Min: Max:	The range of fluctuation of the measured values referred to above (after touching the ‘Statistics’ key).

3.7.3 Filter

The 'Filter' menu is used to call up test programs and settings for the optical filters.



Touch the ‘Filter’ key in the ‘Test program – Photometer’ menu.



The ‘Test program - Photometer - Filter’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Calibration 560nm F:3	Calibrates the photometer (grating and filters). If the calibration has already been carried out, **only** the filter position is changed (range of settings is F:0 to F:4). The text in the key might then be, for example, ‘560nm F:3’ (560nm = the set wavelength; F:3 = the filter position)
Start Abs	The DR2800 can also perform measurements when the sample compartment is open. The dark value (the value measured when the lamp is off) is therefore subtracted from the actual measured value (the value measured when the lamp is on). The measurements are taken in a given chronological sequence. When this key is touched, a measuring cycle is initiated (lamp on, measure, lamp off, measure). The result is displayed as an absorbance value in the output field ‘Abs.:’.
Lamp	The lamp is switched on and off by touching this key. During normal operation, the lamp in the DR2800 is switched off. **CAUTION:** If the lamp is left on for a long period of time, the frame of the DR2800 becomes very hot!
Offset 0 Offset x.xx	The actual measured value becomes the offset value. The text changes to ‘Offset x.xx’. The offset value is reset to zero by touching the key again. The text changes back to ‘Offset 0’.
<-	Moves the filter wheel one step towards lower step numbers or filter position. (The key has a repeat function.)

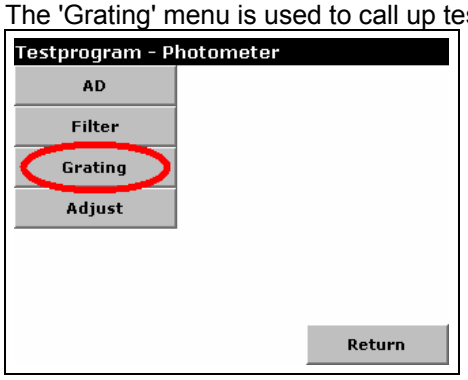
Menu item	Explanation
->	Moves the filter wheel one step towards higher step numbers or filter position. (The key has a repeat function.) 32 steps correspond to one filter position.
Option	**CAUTION** – For use by the development and production departments only!

Explanation of the items in the window:

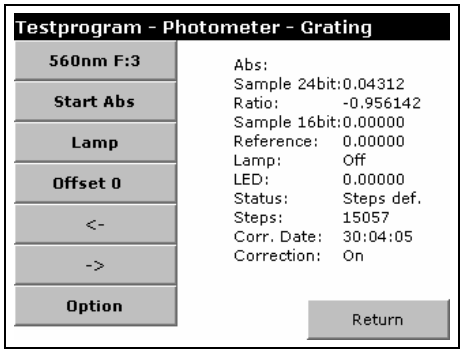
Display	Explanation
Abs:	The measured absorbance.
Sample 24bit:	Measurement channel in V (calculated from ratio).
Ratio:	The ratio of the measurement signal to 4.096V (output of the 24-bit converter). When the measurement signal = ½ of the reference signal, the ratio 1 is reached. A larger measurement signal triggers an error message. When the measurement signal = -½ of the reference signal, the ratio -1 is reached. A smaller measurement signal triggers an error message. In the DR2800 hardware, the signals are linked so that the measurement signal remains in the range between 0 and 1 times the reference signal (ratio -1 to +1). This ratio is the basis for the transmittance.
Sample 16bit:	The measurement channel in V. Measurements with a 16-bit converter.
Reference:	The value of the reference signal in V. Measurements with a 16-bit converter.
Lamp:	Status of the lamp (‘on/off’).
Status:	Status in the filter motor processor: • Reset • Parameter set • Steps def.
Steps:	Number of steps of the filter motor
Current:	**CAUTION** – For use by the development and production departments only!

3.7.4 Grating

The 'Grating' menu is used to call up test programs and settings for the grating.



Touch the ‘Grating’ key in the ‘Test program – Photometer’ menu.



The ‘Test program - Photometer - Grating’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Calibration 560nm F:3	Calibrates the photometer (grating and filters) The position of the zero order is shown graphically. If the calibration has already been carried out, **only** the selected wavelength is set (only at the grating). The text in the key might then be, for example, ‘560nm F:3’ (560nm = the set wavelength; F:3 = the filter position)
Start Abs	The DR2800 can also perform measurements when the sample compartment is open. The dark value (the value measured when the lamp is off) is therefore subtracted from the actual measured value (the value measured when the lamp is on). The measurements are taken in a given chronological sequence. When this key is touched, a measuring cycle is initiated (lamp on, measure, lamp off, measure). The result is displayed as an absorbance value in the output field ‘Abs.:’.
Lamp	The lamp is switched on and off by touching this key. During normal operation, the lamp in the DR2800 is switched off. **CAUTION:** If the lamp is left on for a long period of time, the frame of the DR2800 becomes very hot!
Offset 0 Offset x.xx	The actual measured value becomes the offset value. The text changes to ‘Offset x.xx’. The offset value is reset to zero by touching the key again. The text changes back to ‘Offset 0’.
<-	Moves the grating one step towards lower step numbers or filter position. (The key has a repeat function.)
->	Moves the grating one step towards higher step numbers or filter position. (The key has a repeat function.) 1 step corresponds to approx. 1/3 nm.

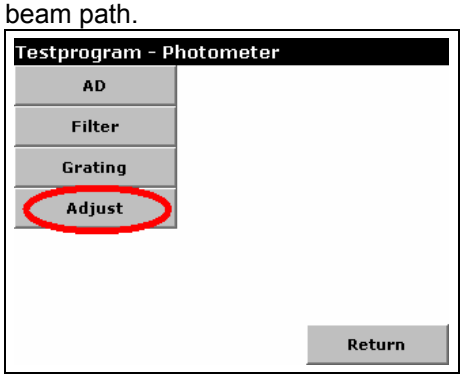
Menu item	Explanation
Option	**CAUTION** – For use by the development and production departments only!

Explanation of the items in the window:

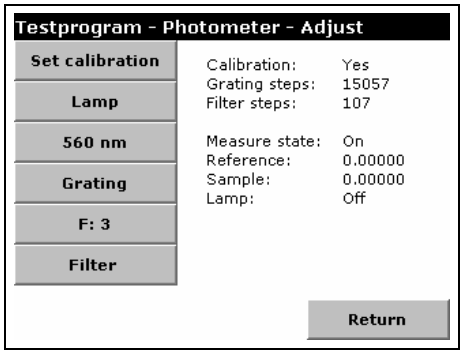
Display	Explanation
Abs:	The measured absorbance.
Sample 24bit:	Measurement channel in V (calculated from ratio).
Ratio:	The ratio of the measurement signal to 4.096V (output of the 24-bit converter). When the measurement signal = ½ of the reference signal, the ratio 1 is reached. A larger measurement signal triggers an error message. When the measurement signal = -½ of the reference signal, the ratio -1 is reached. A smaller measurement signal triggers an error message. In the DR2800 hardware, the signals are linked so that the measurement signal remains in the range between 0 and 1 times the reference signal (ratio -1 to +1). This ratio is the basis for the transmittance.
Sample 16bit:	The measurement channel in V. Measurements with a 16-bit converter.
Reference:	The value of the reference signal in V. Measurements with a 16-bit converter.
Lamp:	Status of the lamp (‘on/off’).
LED:	Level of the zero order in V.
Status:	Status in the grating motor processor: • Reset • Parameter set • Steps def.
Steps:	Number of steps of the grating motor
Carr. Date:	**CAUTION** – For use by the development and production departments only!
Correction:	**CAUTION** – For use by the development and production departments only!

3.7.5 Adjust

The ‘Adjust’ menu is used to call up the options for setting the grating and the optical filter for adjusting the beam path.



Touch the ‘Adjust’ key in the ‘Test program – Photometer’ menu.



The ‘Test program - Photometer - Adjust’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Set calibration	Calibration has not yet been performed: The markers are set to calibrated. Assumes that the grating is set to zero order and filter 3 is positioned at the exit slit: Calibration has already been performed: The markers are reset.
Lamp	The lamp is switched on and off by touching this key. During normal operation, the lamp in the DR2800 is switched off. **CAUTION:** If the lamp is left on for a long period of time, the frame of the DR2800 becomes very hot!
560nm	Goes to a wavelength entered by the user. Only active when calibration has been performed!
Grating	A new menu opens for the grating movement:
<<- Grating Grating ->>	Moves the grating to right or left. The keys have a repeat-function. The speed of the motor increases with each repeat step.
<- Grating Grating ->	Moves the grating to right or left (by 8 steps). The keys have a repeat function.
F: 3	Moves the next filter into position. Only active when the photometer has been calibrated!

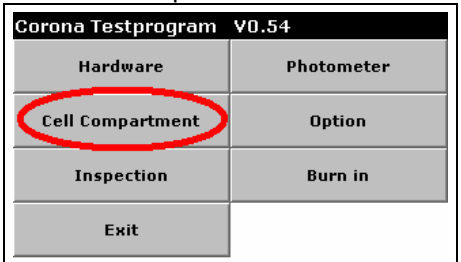
Menu item	Explanation
Filter	A new menu opens for the filter movement:
<<- Filter Filter ->>	Moves the filter right or left. The keys have a repeat function. The speed of the motor increases with each repeat step.
<- Filter Filter ->	Moves the filter right or left (by 8 steps). The keys have a repeat function.

Explanation of the items in the window:

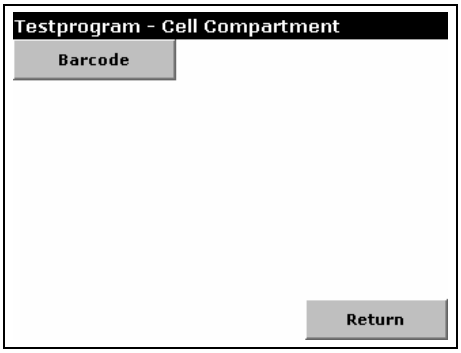
Display	Explanation
Calibration:	Status of the calibration marker.
Grating steps:	Grating motor step counter
Filter steps:	Filter motor step counter
Measure state:	Always 'On'
Reference:	Reference signal values in V.
Sample:	Measurement signal values in V.
Lamp:	Status of the lamp ('On/Off')

3.8 Cell Compartment/Barcode

The 'Cell Compartment' menu is used to call up test programs and settings for the barcode recognition.



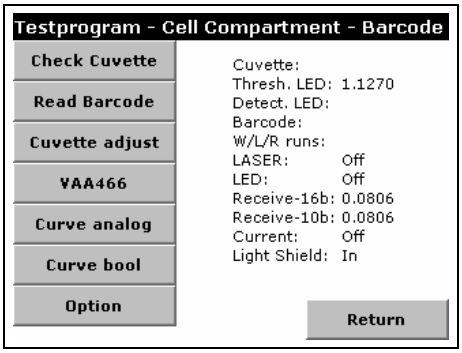
Touch the 'Cell Compartment' key in the main menu of the test program.



The 'Test program - Cell Compartment' menu is displayed.

Now touch the 'Barcode' key.

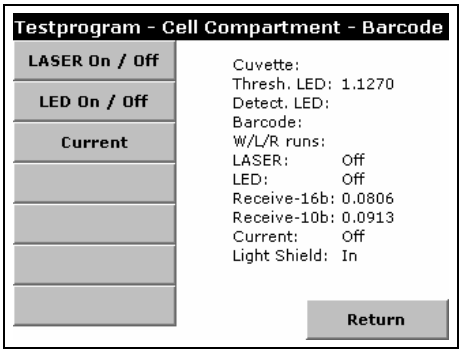
You can go back to the previous menu by touching the 'Return' key.



The ‘Test program - Cell Compartment – Barcode’ menu is displayed.

Touching the ‘Option’ key causes more menu items to be displayed.

You can go back to the previous menu by touching the ‘Return’ key.



Additional menu items in the ‘Test program - Cell Compartment – Barcode’ menu which are called up by touching the ‘Option’ key.

You can go back to the previous screen by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Check Cuvette	Starts check to determine whether a round cuvette is present.
Read Barcode	Reads a barcode. If an error occurs, the read procedure is repeated a maximum of two times (at a lower speed).
Cuvette adjust	Adjusts the cuvette check. You are prompted to remove the cuvette. The difference between the LED values obtained with and without a cuvette is saved.
VAA466	Tests the VAA466 (a 100 g cuvette with an equidistant barcode). The widths of the barcodes must not fluctuate by more than 8 steps (otherwise the cuvette will not be rotated sufficiently evenly). **CAUTION** – For use by the development and production departments and service centres only!
Curve analog	Shows the analogue values measured in ‘Read’ mode (3 graphs of 250 values each)
Curve bool	Shows the values measured in ‘Read’ mode in digitised form (1 graph of 750 values)
Option	Calls up additional menu items (go back by touching ‘Return’)
LASER On/Off	Switches the laser on or off
LED On/Off	Switches the LED on or off
Current	Switches the current to the motor on or off

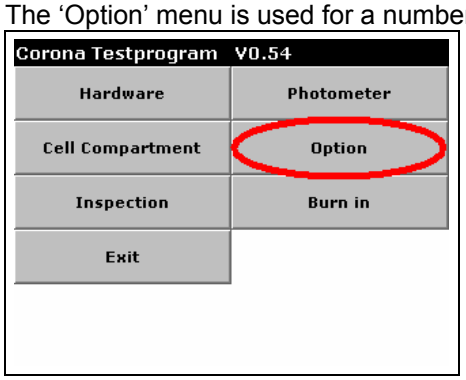
Explanation of the items in the window:

Display	Explanation
Cuvette:	Indicates whether a cuvette has been detected: ‘In’ or ‘Out‘
Thresh. LED:	The LED threshold for cuvette detection.
Detect. LED:	The measured difference between the LED values with and without a cuvette.
Barcode:	If the barcode was read error-free, 7 digits are shown here.
W/L/R runs:	Reading the barcode involves registering 750 analogue levels. They first have to be sorted into black and white, and then into narrow and wide modules. For the sort, average values and then limits are calculated. If the barcode cannot be read properly, these limits can be varied within certain ranges. ‘W’ indicates whether the initially assumed width limit is okay or whether the limit must be varied (max. of 10 attempts). ‘L’ indicates whether the initially assumed level limit is okay or whether the limit must be varied (max. of 20 attempts). If, despite the above variation, no barcode is detected, the cuvette is rotated through another 90 degrees and the measurement is started again. ‘R’ indicates how many read attempts were needed (max. 3).
LASER:	Status of the laser: ‘On’ or ‘Off’’
LED:	Status of the LED: ‘On’ or ‘Off’
Receive-16b:	Level of the barcode sensor with the 16-bit ADC.
Receive-10b:	Level of the barcode sensor with the 10-bit ADC. This is the faster converter and is used to read the barcode. The 16-bit converter is used to detect whether a cuvette is present.
Current:	Status of the barcode motor: ‘On’ or ‘Off’
Light Shield:	Position of the light shield: ‘In’ or ‘Out’).

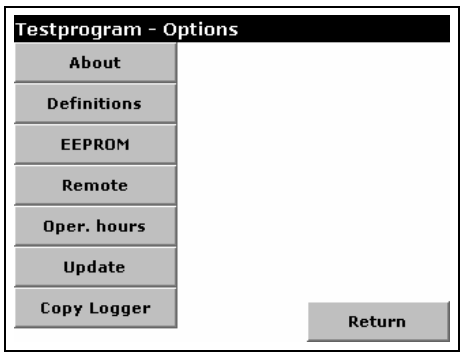
3.9 Option

3.9.1 General

The ‘Option’ menu is used for a number of settings.



Touch the ‘Option’ key in the test program main menu.



The menu ‘Test program - Options’ is displayed.

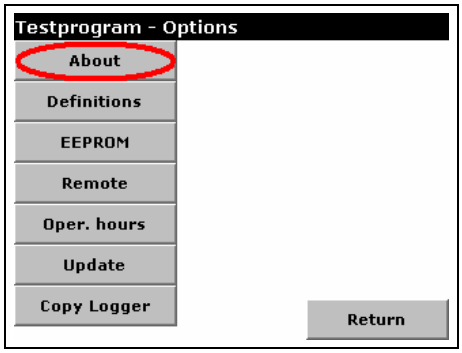
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

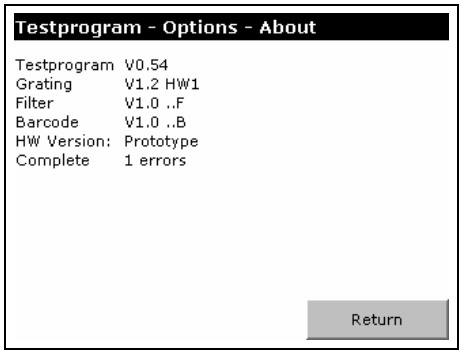
Menu item	Explanation
About	The names and versions of various programs and the result of the complete test are displayed (see section 3.9.2 About).
Definitions	Access to instrument definitions (see section 3.9.3 Definitions).
EEPROM	The factory settings are displayed (see section 3.9.4 EEPROM).
Remote	**CAUTION** – For use by the development and production departments only!
Oper. Hours	Hours of operation of the lamp (see section 3.9.5 Oper. hours)
Update	Update of the photometer software through the USB port (see section 3.9.6 Update)
Copy Logger	Copies the photometer’s results log to a USB memory stick (see section 3.9.7 Copy Logger)

3.9.2 About

The ‘About’ menu is used to display the names and versions of various programs and the result of the hardware check.



Touch the ‘About’ key in the ‘Test program - Options’ menu.



The menu ‘Test program - Options – About’ is displayed.

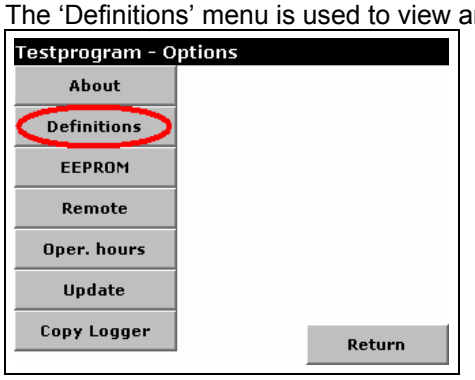
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the items in the window:

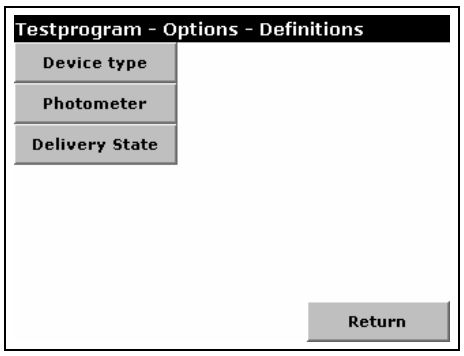
Display	Explanation
Test program	Shows the version number of the test program.
Grating	Shows the version number of the program of the grating motor board.
Filter	Shows the version number of the program of the integrated circuit of the filter motor.
Barcode	Shows the version number of the program of the integrated circuit of the barcode motor.
HW Version	Shows the hardware version of the photometer: ‘Prototype’, ‘Pilot series’, ‘Series’ or ‘EMV series’
Complete	Shows the result of the hardware check: ‘not done’, ‘ok’ or ‘x errors’.

3.9.3 Definitions

The ‘Definitions’ menu is used to view and adjust definitions.



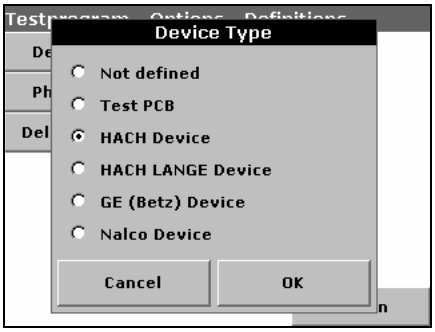
Touch the ‘Definitions’ key in the ‘Test program - Options’ menu.

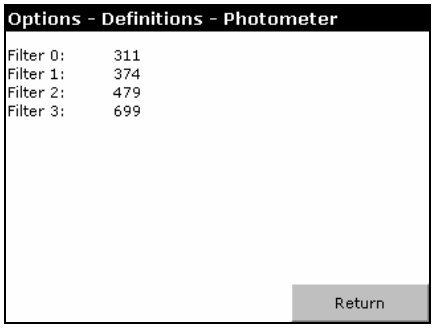


The ‘Test program - Options - Definitions’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

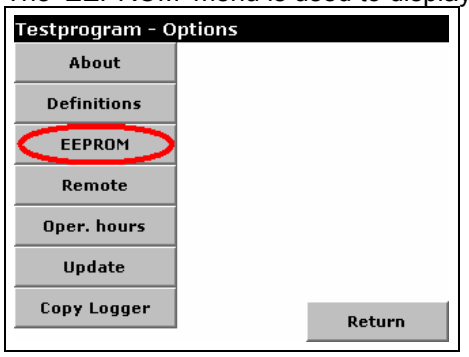
Explanation of the menu items:

Menu item	Explanation
Device type 	For the ‘Hardware Check’ (‘Inspection’), the program needs to know what device type (photometer or printed circuit board) has to be tested. This information is stored on the grating motor board. If the grating motor board is new, the device type is not yet defined. If the device type is found to be undefined when an inspection is carried out, the function described here is automatically called up. The setting is displayed (‘not defined’, ‘Test PCB’, ‘HACH Device’, ‘HACH LANGE Device’, ‘GE (Betz) Device’ or ‘Nalco Device’). The setting can be changed. If it is changed from ‘Not defined’ to one of the other settings, the new setting is immediately saved. If the setting is to be changed, the prompt ‘Set new device type?’ is displayed. Touching ‘ok’ causes a prompt for a code number to be displayed. This code number is confidential and can only be called up directly in the development department. Because the definition of the device type is stored on the grating motor board, a photometer remains the same, e.g. a ‘HACH LANGE’ device, even after the microprocessor board is replaced!

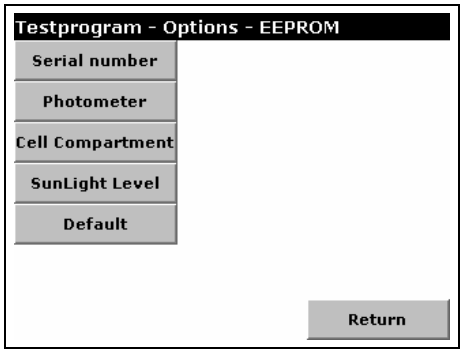
Menu item	Explanation
Photometer 	The wavelengths at which filter changes occur are displayed.
Delivery State 	Touching the ‘OK’ key causes all instrument settings that have been changed by the customer to be reset to the default values (factory settings). All measurement data are deleted. The next time the photometer is started, the language selection menu is automatically called up.

3.9.4 EEPROM

The ‘EEPROM’ menu is used to display the factory settings.



Touch the ‘EEPROM’ key in the ‘Test program - Options’ menu.



The ‘Test program - Options - EEPROM’ menu is displayed.

You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

Menu item	Explanation
Serial number	A window opens, in which the serial number of the photometer can be entered. This has to be done after the grating motor board and grating motor are replaced.
Photometer	The factory settings are displayed (see page 36: “Explanation of the items in the window after touching the ‘Photometer’ key:”).
Cell Compartment	The factory settings are displayed (see page 36: “Explanation of the items in the window after touching the ‘Cell Compartment’ key:”).
SunLight Level	**CAUTION** – For use by the development and production departments only!
Default	**CAUTION** – For use by the development and production departments only! Default deletes the factory settings. To prevent the settings from being overwritten unintentionally, the instrument prompts for a confirmation.

Explanation of the items in the window after touching the 'Photometer' key:

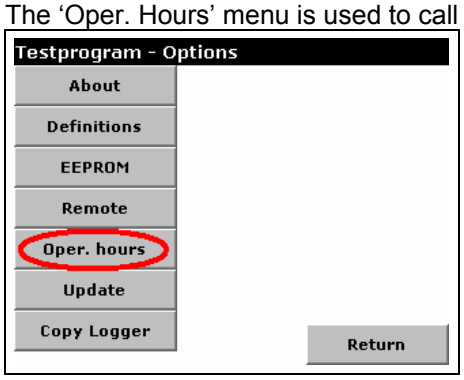
Display	Explanation
Serial no.:	The stored serial number
Adjust date:	Date of the last factory adjustment
Grat. Offset:	Currently always 0
Grat. Angle:	Adjusted angle
LED threshold:	Adjusted threshold
Meas. Fac.:	Adjusted factor for 16 bit to 24 bit
Meas. Offset:	Adjusted offset for 16 bit to 24 bit
On time:	Waiting time after the lamp is switched on
Off time:	Waiting time after the lamp is switched off
Poti F1 M/R:	Adjusted potentiometer setting for filter 1 for measurement/ref.
Poti F2 M/R	Adjusted potentiometer setting for filter 2 for measurement/ref.
Poti F3 M/R:	Adjusted potentiometer setting for filter 3 for measurement/ref.
Poti F4 M/R:	Adjusted potentiometer setting for filter 4 for measurement/ref.

Explanation of the items in the window after touching the 'Cell Compartment' key:

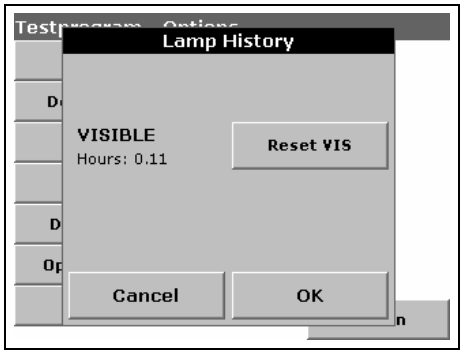
Display	Explanation
Cuvette LED:	Adjusted threshold LED value for cuvette detection
Cuvette Laser:	Adjusted threshold laser value for cuvette detection
Factor Sample:	Factor the sunlight detection thresholds given below
Factor Reference:	Factor the sunlight detection thresholds given below
SL-Level F1 M/R:	Sunlight detection threshold for filter 1
SL-Level F2 M/R:	Sunlight detection threshold for filter 2
SL-Level F3 M/R:	Sunlight detection threshold for filter 3
SL-Level F4 M/R:	Sunlight detection threshold for filter 4
SL-Level Cuvette:	Sunlight detection threshold for cuvette detection

3.9.5 Oper. hours

The ‘Oper. Hours’ menu is used to call up the number of hours of operation of the lamp.



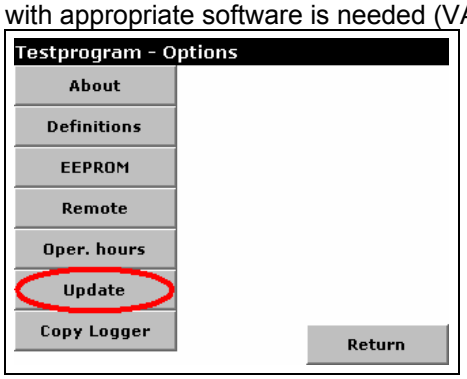
Touch the ‘Oper. hours’ key in the ‘Test program - Options’ menu.



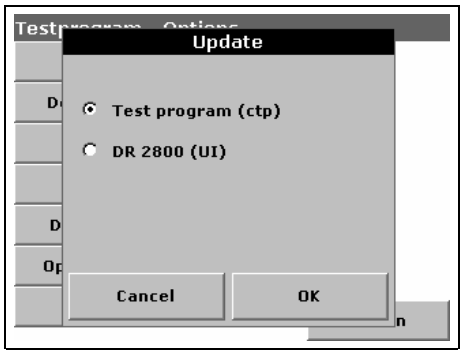
The ‘Lamp History’ is displayed from the user program. The number of hours of operation can be set to zero in this window.

3.9.6 Update

The 'Update' menu is used to update the photometer software through the USB port. A USB memory stick with appropriate software is needed (VAA608).



Touch the ‘Update’ key in the ‘Test program - Options’ menu.



In the ‘Update’ window, select the program you want to update – ‘DR 2800 (UI)’ – and confirm by touching the ‘OK’ key. The system then seeks the program on the memory stick.

When the program is found, the program on the DR2800 is deleted and the new version is installed, together with the associated databases. This process takes about one minute. When the installation is complete, the message ‘ok’ ‘Restart Device’ appears. The DR2800 **must** be switched off and restarted. After the restart, the map of the world may be displayed for up to 2 minutes. During this time the test database is installed, so the photometer must not be switched off!

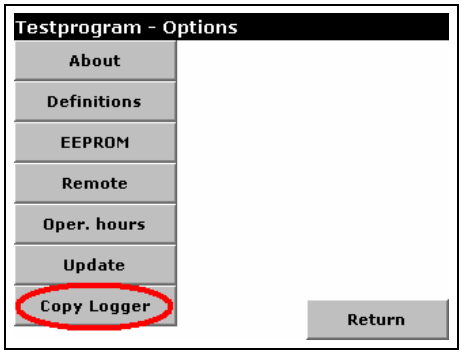
If no memory stick is plugged in, or the required program is not found on the memory stick, a corresponding error message is displayed.

3.9.7 Copy Logger

The ‘Copy Logger’ function copies the photometer’s event log to a USB memory stick. The event log contains the instrument history and a record of any error messages.

The log is saved on the memory stick as a text file with the name “Logger.txt”.

This function can help service personnel to identify errors more quickly, especially when it is not clear what is wrong or when customers’ are unable to provide sufficient information.



Touch the ‘Copy Logger’ key in the ‘Test program – Options’ menu. The event log is then copied to the USB memory stick.

Explanation of the content of the event log:

Display	Explanation	Example
First line:	Instrument name and serial number	DR 2800, S/N 1150159
Second line:	Software version	Instrument Version: 1.02i
Additional lines:	Time and date of the log entry and an index number that provides more information about the entry.	2006-01-12 12:45:43,2, 2006-01-12 12:45:46,4,130,

Explanation of the index numbers of the event log:

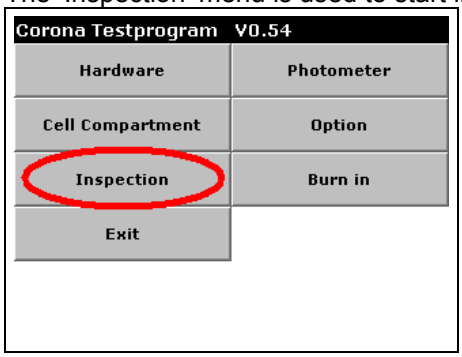
Index-number	Explanation	
1	Enter comments	
2	Photometer was switched on	
3	Error during initialisation of the microprocessor board	
4, xxx	Error during initialisation of peripheral electronics (e.g. motor control circuit, AD conversion circuit, etc.), error number	
	Error no.	**Explanation**
	01	No response from grating motor controller
	02	No response from filter, barcode, carousel or mirror motor controller
	04	Faulty control parameters for grating motor
	08	Faulty control parameters for filter motor
	32	Faulty control parameters for barcode motor
	128	Hardware adjust data in EEPROM: Check sum is not ok
	256	Error while reading the grating motor correction data
	512	Grating motor correction data in EEPROM: Check sum is not ok
5, xxxx	An error occurred while the instrument was being photometrically calibrated, error number	
	Error no.	**Explanation**

Index-number	Explanation	
	1024	The wavelength setting is outside the permissible range
	2048	Error in the grating motor board area; the grating could not be positioned as required
	4096	Error in the peripherals board area; the filter could not be positioned as required
	16384	The measured voltages were outside the correct range. Possibly too much or too little light during the calibration of the grating/filter.
6, x.xxxx, x.xxxx	Error: Check air reading (remove cuvette first), measured value at 560 nm, stored air value at 560 nm	
7, x.xxxx, x.xxxx	Error: Check whether new air reading is necessary, measured value at 560 nm, stored air value at 560 nm	
9, xx	Error: An error occurred while the air reading was being carried out, error number	
	Error no.	**Explanation**
	1	Faulty dark measurement with AD converter (24 bit)
	2	Faulty brightness measurement with AD converter (24 bit)
	3	Too little light during brightness measurement on the measurement channel
	4	Too little light during brightness measurement on the reference channel
	5	Too little separation of brightness and dark values on the reference channel
	6:	Too little separation of brightness and dark values on the measurement channel
	7	Calculated quotient is too low (reference value/measurement value)
	8	Calculated absorbance value is too high
	9	Too much light during dark measurement on the measurement channel
	10	Too much light during dark measurement on the reference channel
11	An error occurred while the absorbance was being measured	
12	Error: An error occurred while the filter wheel was rotating.	
13	Error: The barcode could not be read.	
15, xx	Error during software update, error number	
	Error no.	**Explanation**
	1	Database update with a zipped tar archive failed
	2	Database update with individual files failed
	3	Language update with a zipped tar archive failed
	4	Language update with individual files failed
	5	Instrument driver update with a zipped tar archive failed
	6	General update with a zipped tar archive failed
	7	User program update with a zipped tar archive failed
16	Error: The light shield was not detected/was not in place when a round cuvette was measured.	
17	The battery capacity was < 3%	

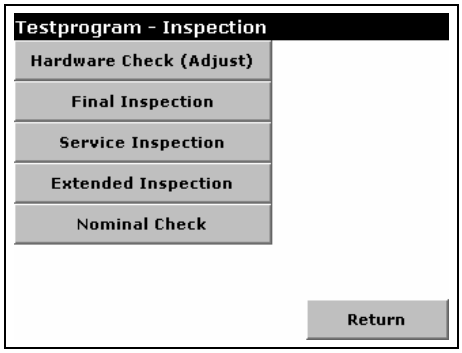
Index-number	Explanation
18	The test program was called up

3.10 Inspection

The ‘Inspection’ menu is used to start inspection programs.



Touch the ‘Inspection’ key in the test program main menu.



The ‘Test program – Inspection’ menu is displayed.

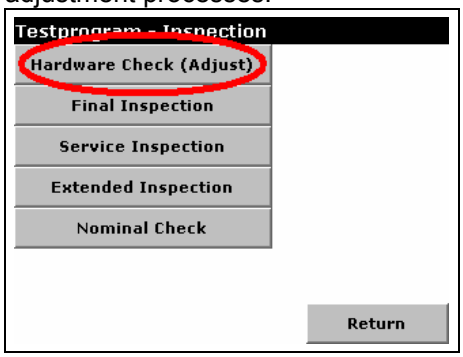
You can go back to the previous menu by touching the ‘Return’ key.

Explanation of the menu items:

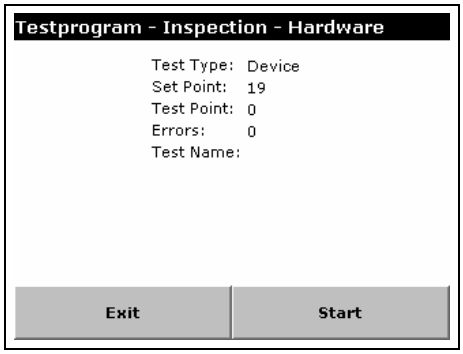
Menu item	Explanation
Hardware Check (Adjust)	Complete test of the photometer, including all adjustment processes (see section 3.10.1 Hardware Check (Adjust))
Final Inspection	**CAUTION** – For use by the development and production departments only!
Service Inspection	Final inspection of the photometer after a service (see section 3.10.2 Service Inspection)
Extended Inspection	**CAUTION** – For use by the development and production departments only!
Nominal Check	**CAUTION** – For use by the development and production departments only!

3.10.1 Hardware Check (Adjust)

The ‘Hardware Check (Adjust)’ menu is used to start a complete check of the photometer, including all adjustment processes.



Touch the ‘Hardware Check (Adjust)’ key in the ‘Test program – Inspection’ menu.



The ‘Test program - Inspection – Hardware’ menu is displayed.

The program is started by touching the ‘Start’ key. The execution of the program is described in section 6.2.

Explanation of the menu items:

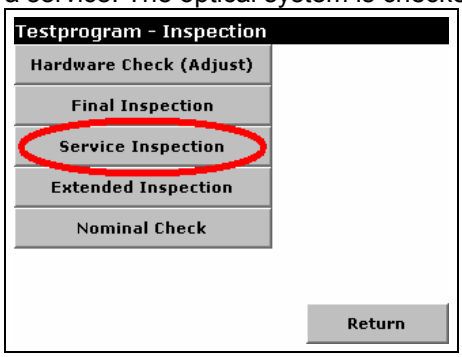
Menu item	Explanation
Exit	Returns to the previous menu.
Start	Starts the program for the photometer, including all adjustment processes.

Explanation of the items in the window:

Display	Explanation
Test Type:	Type of test
Set Point:	Set point
Errors:	Number of errors detected
Test Name:	Test name

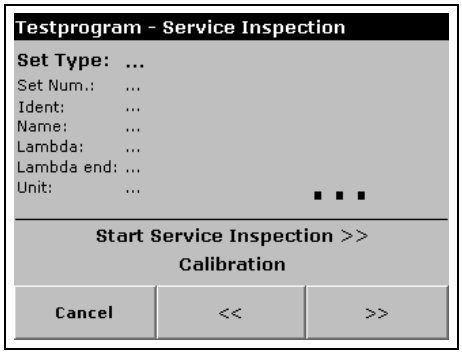
3.10.2 Service Inspection

The ‘Service Inspection’ menu is used to start the program for the final inspection of the photometer after a service. The optical system is checked using test filters (see section 6.3).



Touch the ‘Service Inspection’ key in the ‘Test program – Inspection’ menu.

The program for the final inspection of the photometer after a service starts.



The ‘Test program – Service Inspection’ menu is displayed.

The program is started by touching the ‘Start’ key. The execution is described in section 6.3.

Explanation of the menu items:

Menu item	Explanation
Cancel	Cancel the inspection
>>	Start the test in accordance with the status line
<<	Go back one test. The status line shows the test that is to be repeated.

Explanation if the above menu items:

Menu item	Explanation
Set Type	Name of the test filter set
Set Num	Number of the test filter set
Ident	Identity number of the test aid
Name	Name of the test aid; cuvette name
Lambda	Wavelength or initial wavelength for scan
Lambda end	Final wavelength for scan
Unit	Unit (e.g. nm, Abs)

Above the keys are the two status lines with the appropriate instructions for the user (e.g.: Wait or Next test aid).

4 Repairs

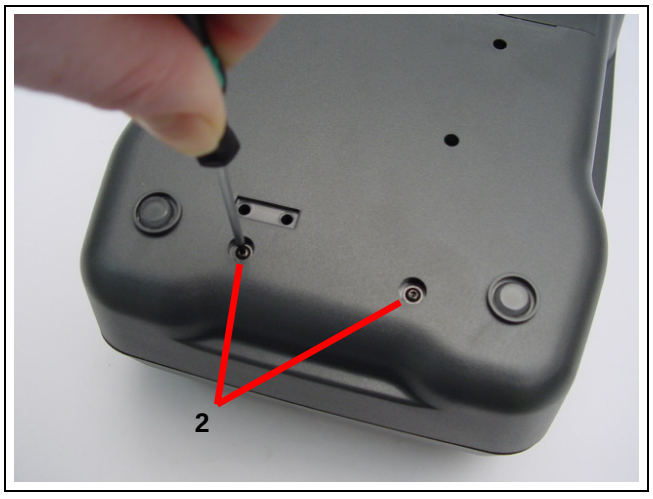
Note: After a component has been replaced, a hardware adjustment and service inspection must always be carried out (see sections 6.2 and 6.3)!

4.1 Opening the spectrophotometer

Open the DR2800 as described below. Return it to its original state by carrying out the steps in the reverse order.

SAFETY INFORMATION:
Before opening the photometer, always make sure that it has been unplugged and the batteries have been removed!

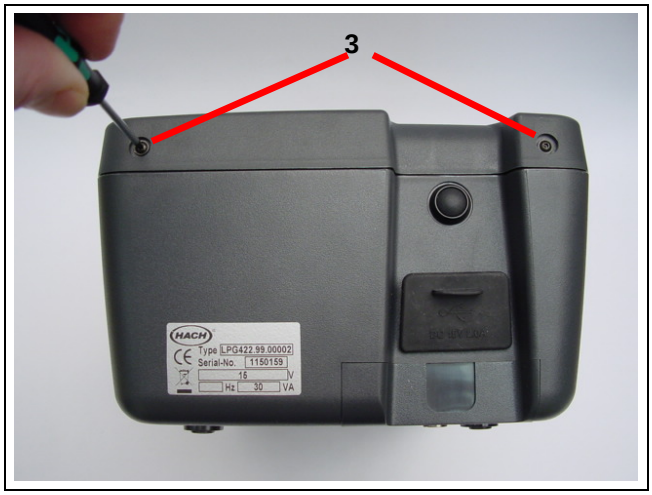
1. Remove the light shield (1) and the cell adapter from the cell holder 50 mm.



2. Loosen the two screws (2) at the bottom front of the photometer.

Note:

Do not unscrew the two screws (2) completely. Two turns per screw should suffice.



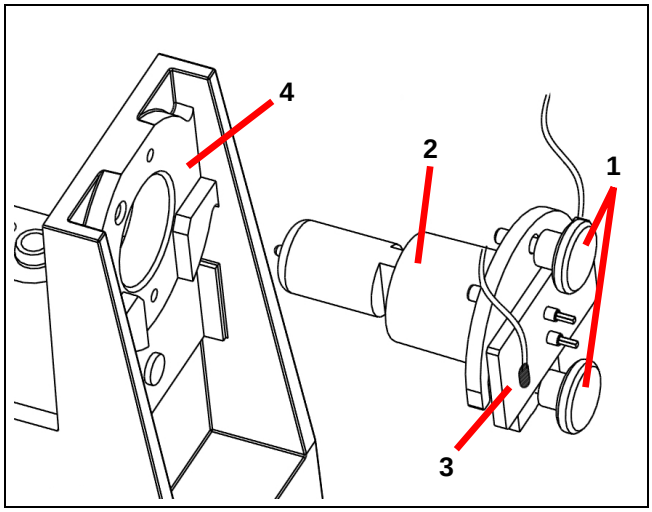
3. Remove the two screws (3) from the back of the photometer.

4. Grasp the back of the housing top (4) and lift until it comes free.

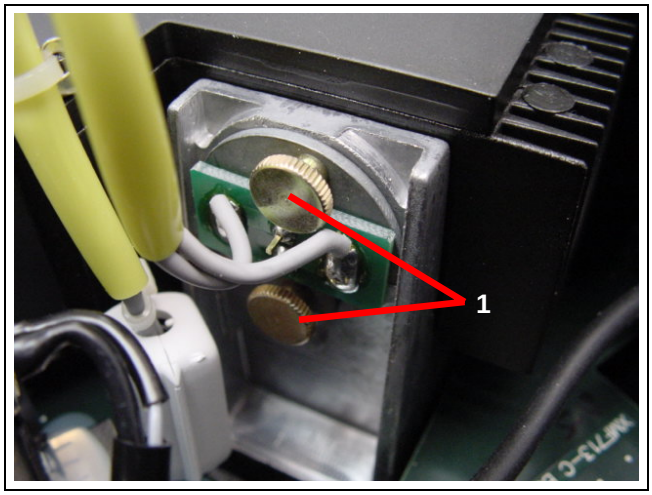
Return the photometer to its original state by carrying out steps 1 to 4 in reverse order.

4.2 Halogen lamp

The halogen lamp of the DR2800 can be replaced from below, as described in the User Manual. It can also be replaced when the photometer is open.

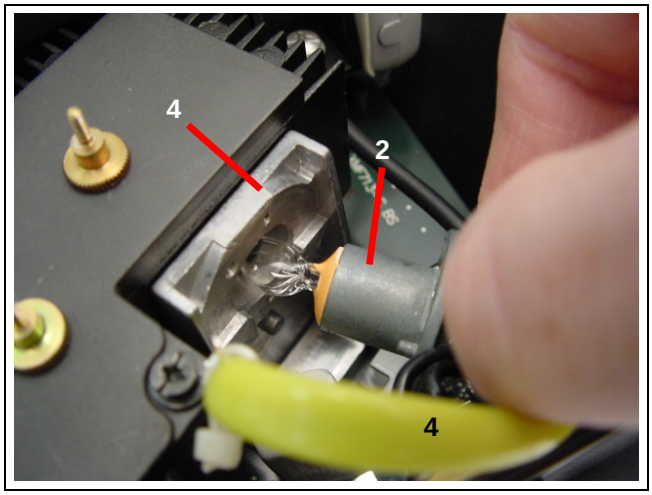


1 - Knurled screws (LZV608)
2 - Halogen lamp (LZV565)
3 - Lamp socket board (YAB081)
4 - Lamp holder

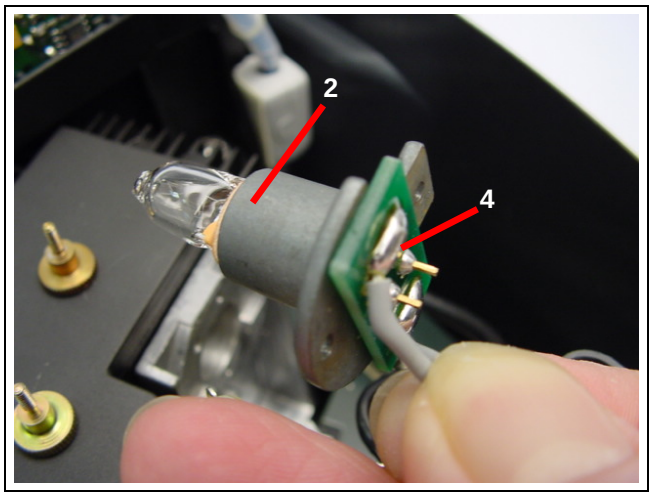


1. Open the photometer (see section 4.1).

2. Remove the two knurled screws (1).



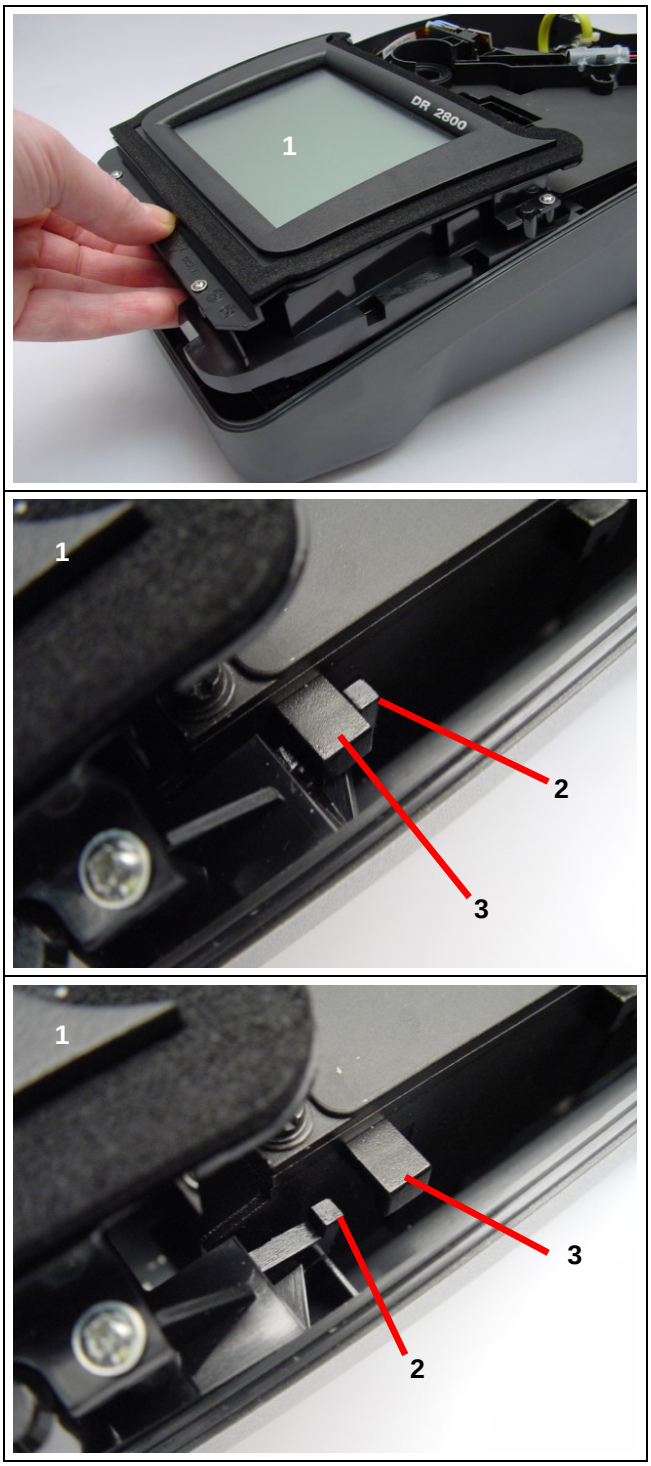
3. Unplug the halogen lamp (2) and the lamp socket board (3) from the lamp holder (4).



4. Finally, unplug the lamp socket board (3) from the contacts of the halogen lamp (2).

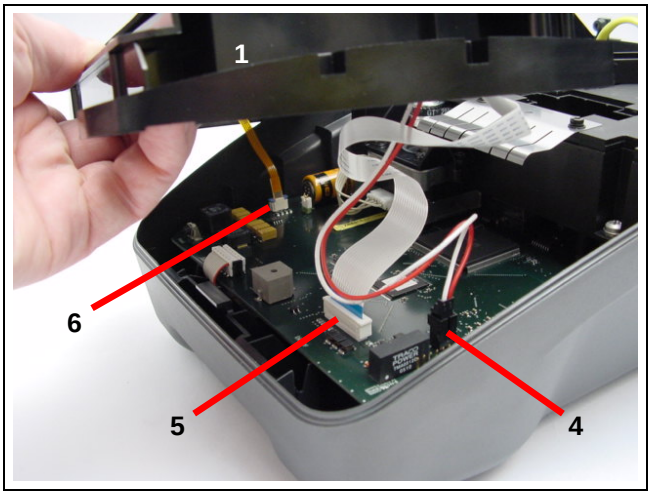
To install a halogen lamp, carry out steps 1 to 4 in reverse order.

4.3 Display assembly



1. Open the photometer (see section 4.1)

2. Lift the front of the display assembly (1) and pull it gently forward until the interlocking parts (2) and (3) are free of each other.



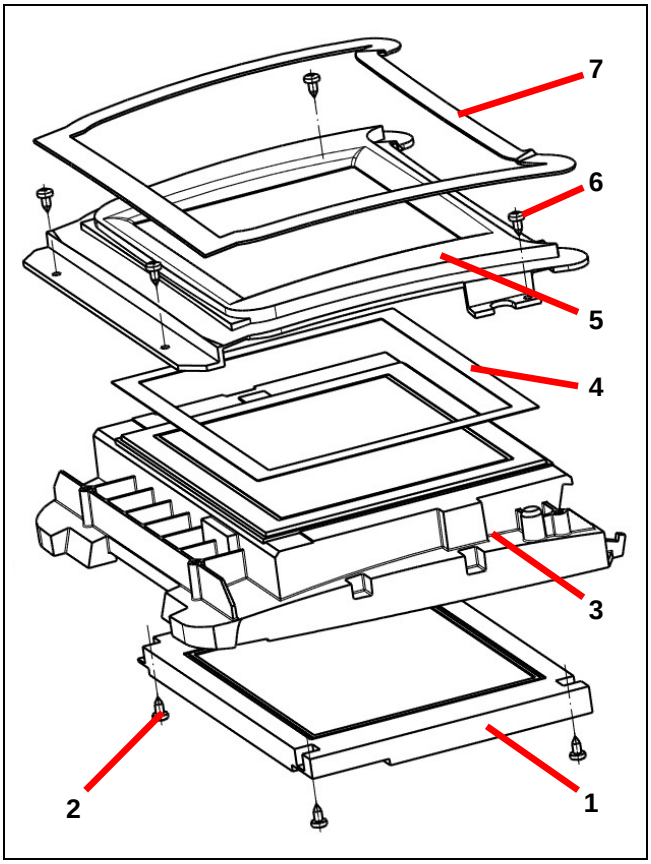
3. Carefully lift the display assembly (1) in order to disconnect the following electrical contacts:

   Display backlighting (4)

   Display data cable (5)

   Touchpad (6)

To install the display assembly, carry out steps 1 to 3 in reverse order.



1 - Display (YAB084)

2 - Screw for plastic (3.0 x 6), head with flat collar/type Z recess (4x)

3 - Touchscreen, complete (LZV611)

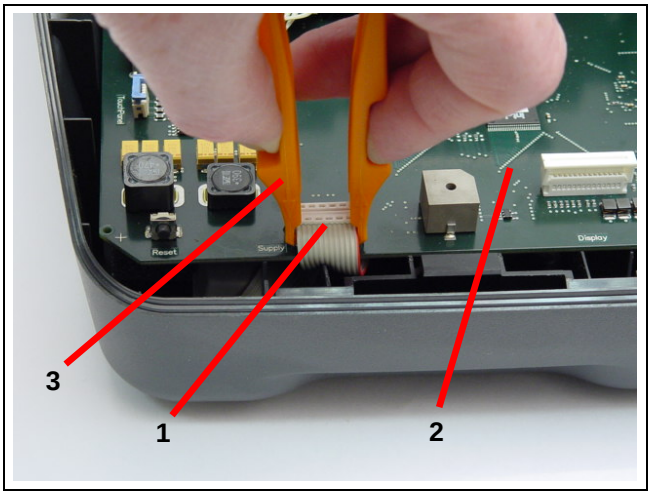
4 - Display seal (LZV643)

5 - Display frame (LZV609)

6 - Screw for plastic (3.0 x 6), head with flat collar/type Z recess (4x)

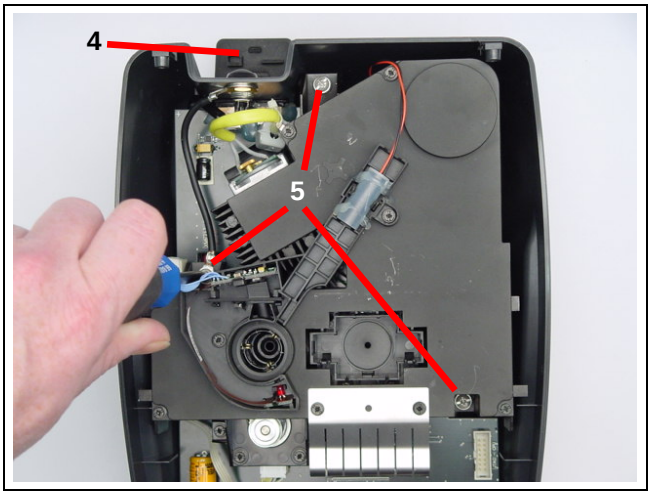
7 - Display-frame seal (LZV606)

4.4 Removing the beam path from the housing bottom

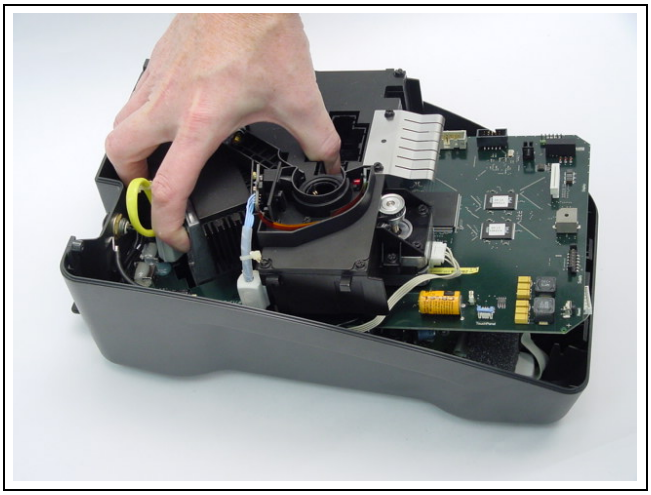


1. Open the photometer (see section 4.1)
2. Remove the display assembly (see section 4.1)
3. Unplug connector (1) from the microprocessor board (2).

   Note: Always use the Lumberg AZ30 tongs (3) to remove the connector (1)!



4. Open the USB cap (4) on the back of the photometer.
5. Remove the three screws (5) holding the bottom of the frame to the bottom of the housing.

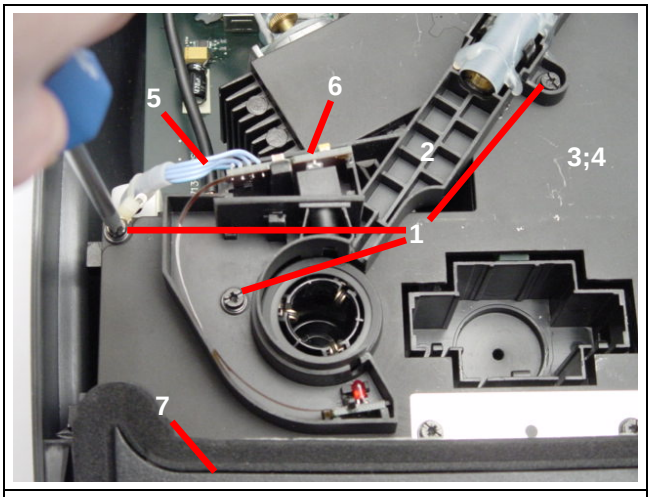


6. Lift the complete beam path, together with the microprocessor board, out of the housing bottom, as shown in the illustration.

To install the beam path, carry out steps 1 to 6 in reverse order.

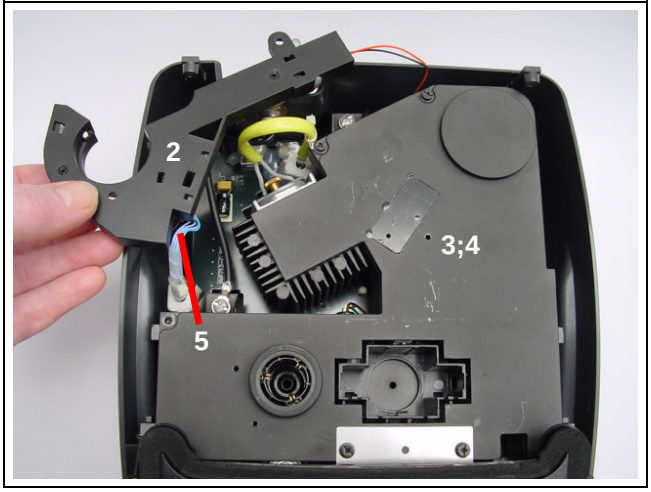
4.5 Opening the beam path

The beam path sometimes needs to be removed from the housing bottom before the photometer is opened, e.g. to replace the filter wheel or the grating motor.



1 - Washer-and-screw assembly M3x8-Z1-3-8.8-A2
2 - Barcode reader (LZV658)
3 - Frame top
4 - Frame bottom
5 - Connector of the barcode sensor board (YAB080)
6 - Barcode sensor board (YAB080)
7 - Display assembly

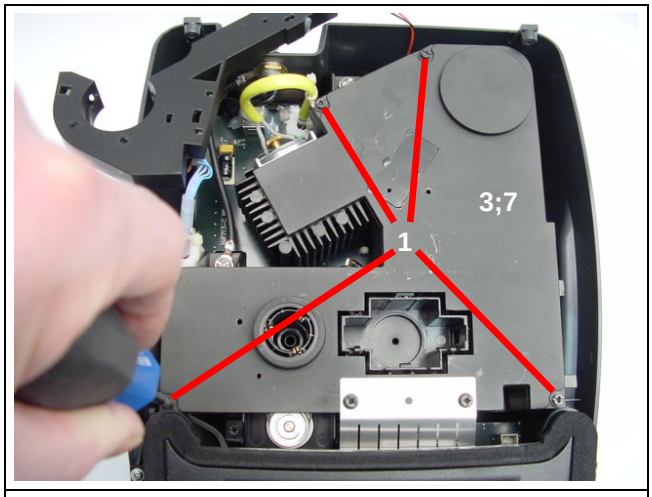
1. Open the photometer (see section 4.1)

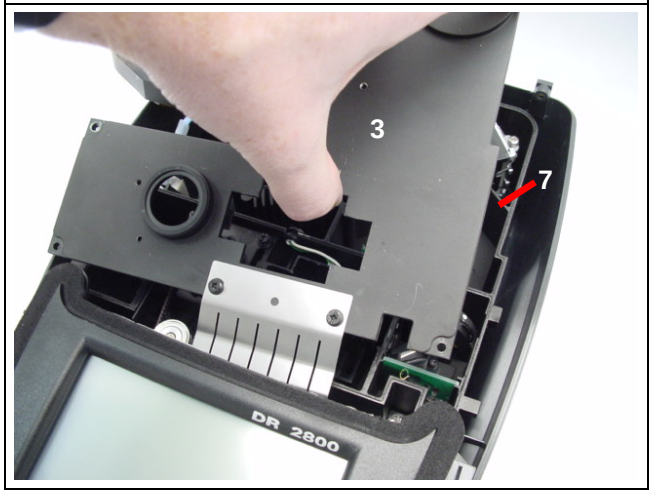


2. Remove the three screws (1) and remove the barcode reader (2) from the frame top (3) as shown in the illustration.

   Note: Take care not to damage the connector (5) of the barcode sensor board (6).

3. Lift the front of the display assembly (7) and pull it gently forward until all the screws on the frame top (3) are accessible.

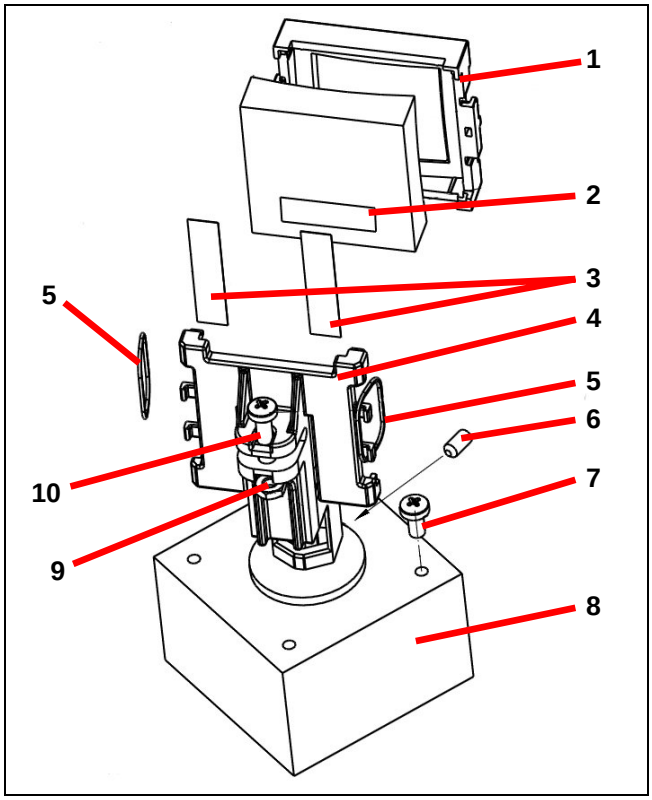




4. Remove the four screws (1) and lift the frame top (3) off the frame bottom (7).

To install the beam path, carry out steps 1 to 4 in reverse order.

4.6 Concave grating and grating motor



1 - Grating surround

2 - Concave grating (LZV592)
Note: Label at the bottom!

3 - Adhesive strips

4 - Grating holder

5 - O-ring (LZV6630

6 - Set screw
ISO 4029 - M 3 x 4
(locked with Loctite 242)

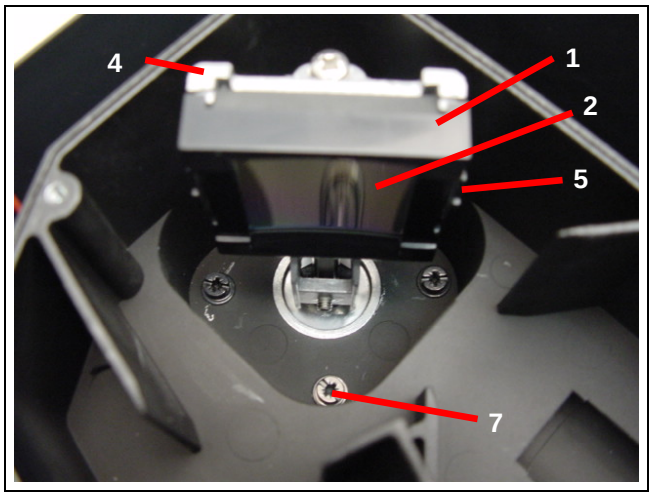
7 - Washer-and-screw assembly
M3x6-Z1-3-8.8-A2 (4x)
(for fastening pos. 8 to the frame bottom)

8 - Motor board with stepper motor (YAB079)

9 - Hexagonal nut ISO 4032 - M 3

10 - Cross-recessed flat-head screw
ISO 7045 - M 3 x 14 - A4 - 70 – Z
(locked with Loctite 242)

Removing the concave grating

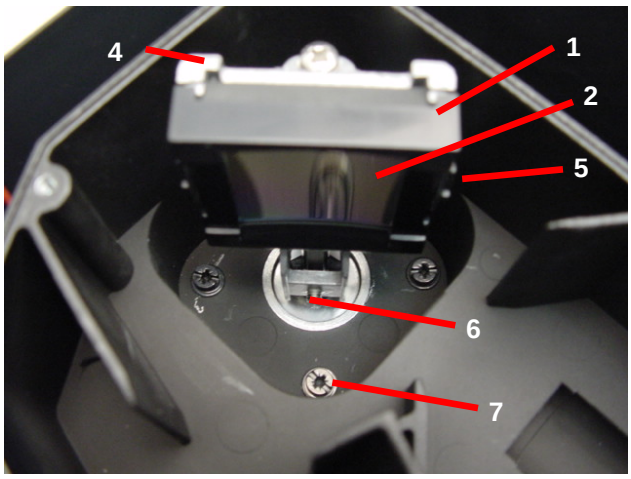


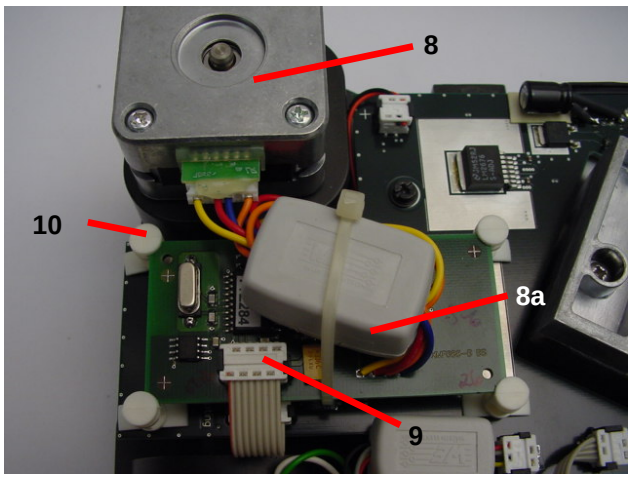
1. Open the photometer (see section 4.1)
2. Open the beam path (see section 4.5)
3. Loosen the O-rings (5) and remove first the surround (1) and then the concave grating from the grating holder (4).

   CAUTION: Do not touch the optical surface!

To install the grating, carry out steps 1 to 3 in reverse order.

Removing the motor board and stepper motor





1. Open the photometer (see section 4.1)
2. Remove the beam path (see section 4.4)
3. Open the beam path (see section 4.5)
4. Loosen the set screw (6) through the external hole in the frame bottom and draw the grating holder (4), the surround (1) and the concave grating (2) off the motor shaft.

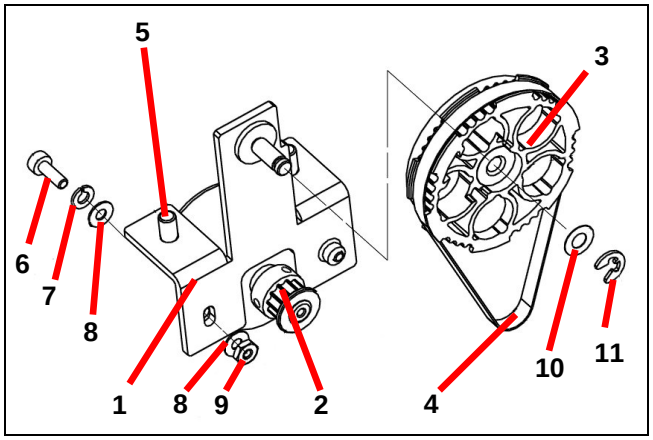
   CAUTION: Do not touch the optical surface!
5. Disconnect the connector (9) from the motor board (8a).
6. Remove the motor board (8a) from the four spacers (10)
7. Remove the four screws (7) and remove the stepper motor (8) from the frame bottom.

To install the motor board, carry out steps 1 to 7 in reverse order.

After the motor board is installed, the height adjustment of the grating must be reset! (See section 5.5 Adjusting the beam path.)

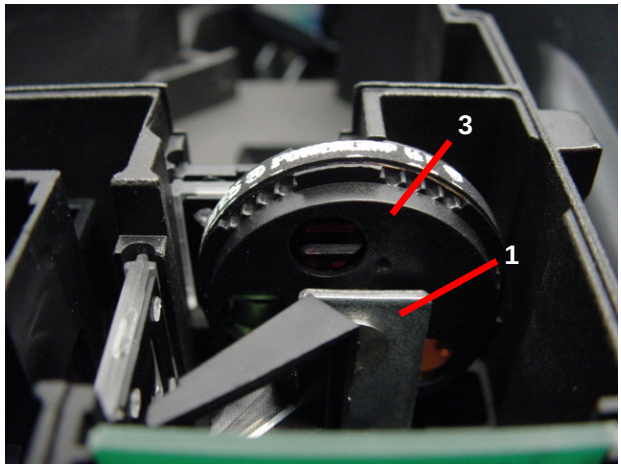
CAUTION: The adjustment of the beam path must be checked after the replacement has been carried out!

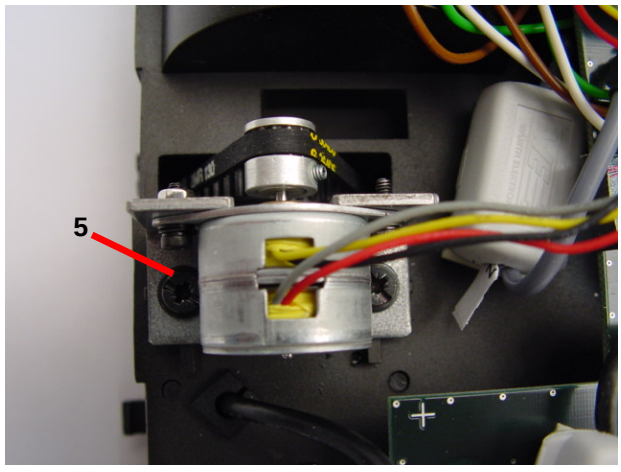
4.7 Filter wheel and stepper motor for filter changer



1 - Filter wheel holder
2 - Stepper motor for filter changer (LZV614)
3 - Bonded filter wheel (LZV591)
4 - Toothed belt (LZV593)
5 - Washer-and-screw assembly M3x6-Z1-3-8.8-A2 (2x) (for fastening in the frame bottom)
6 - Hexagon socket head screw ISO 4762 - M 2 x 6
7 - Spring washer DIN 137
8 - Washer DIN 433 – 2.2
9 - Hexagonal nut ISO 4032 - M 2
10 - Spacer ring DIN 988 - 3 x 6 x 0,1
11 - Locking washer DIN 6799 – 2.3

Removing the filter assembly





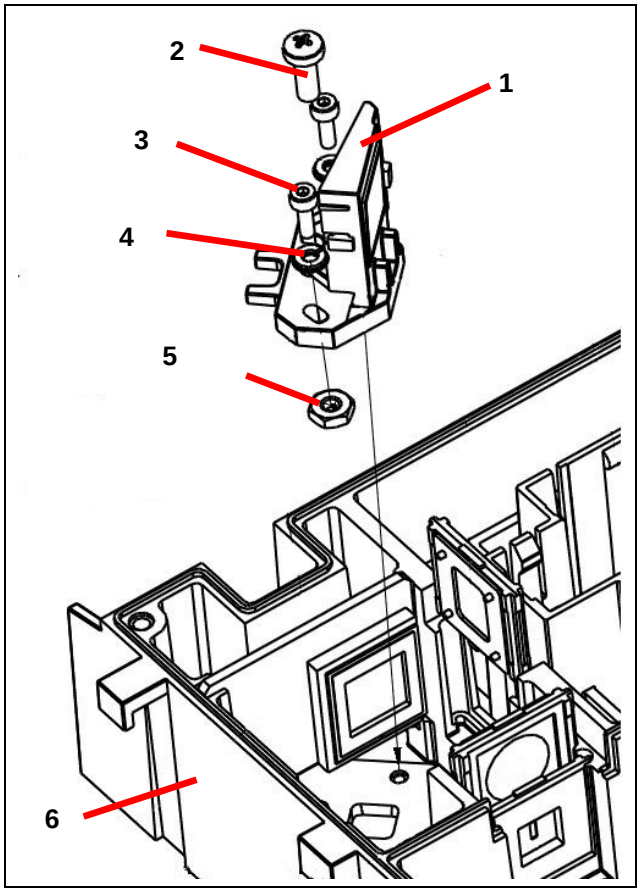
1. Open the photometer (see section 4.1)
2. Remove the beam path (see section 4.4)
3. Unplug the filter motor from the microprocessor board.
4. Remove the two screws (5) and lift the total assembly out of the frame bottom.
5. The assembly can now be disassembled as shown in the diagram, and the motor (2) or the filter wheel (3) can be replaced.

To install the assembly, carry out steps 1 to 5 in reverse order.

Note: When the two screws (5) are being tightened, take care not to twist the filter wheel holder (1).

CAUTION: The adjustment of the beam path must be checked after the replacement has been carried out!

4.8 Beam splitter mirror



1 - Mounted beam splitter mirror (LZV590)

2 - Hexagon socket head screw
ISO 4762 - M 2 x 6 - 8.8 - A2S

3 - Cross-recessed flat-head screw
ISO 7045 - M 3 x 8 - 4.8 - A2S – Z

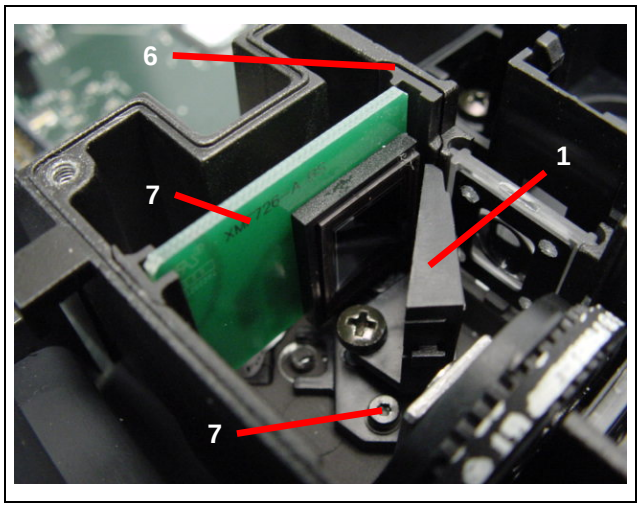
4 - Washer DIN 433 – 2.2 - 140 HV - A2S

5 - Hexagonal nut ISO 4035 - M 3 - A4 – 70

6 - Frame bottom

CAUTION: The adjustment of the beam path must be checked after the replacement has been carried out!

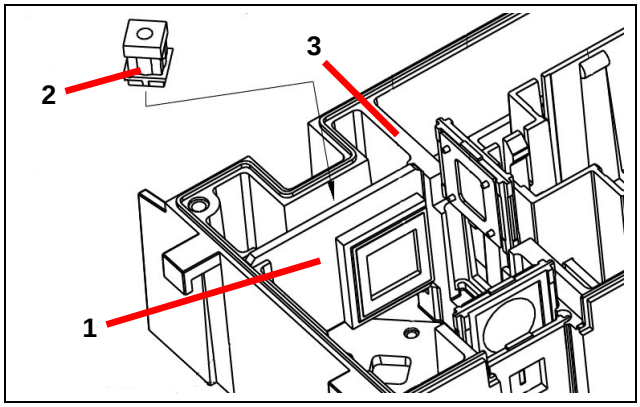
Removing the beam splitter mirror



1. Open the photometer (see section 4.1).
2. Remove the beam path (see section 4.4).
3. Open the beam path (see section 4.5).
4. Unplug the reference board (7) from the microprocessor board and remove the lead-through sleeve from the frame bottom (6).
5. Lift the reference board (7) out of the frame bottom (6).
6. Remove the two screws (3).
7. Remove the two screws of the beam splitter mirror.
8. Lift the beam splitter mirror (1) out of the frame bottom.

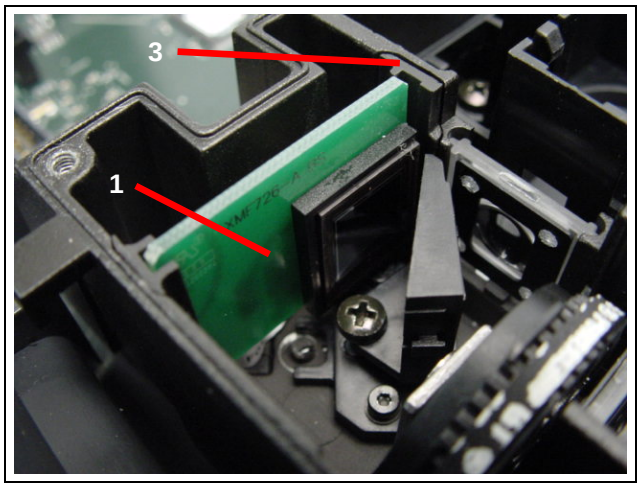
To install the beam splitter mirror, carry out steps 1 to 8 in reverse order.

4.9 Reference board



1 - Reference board
2 - Lead-through sleeve
3 - Frame bottom

Removing the reference board

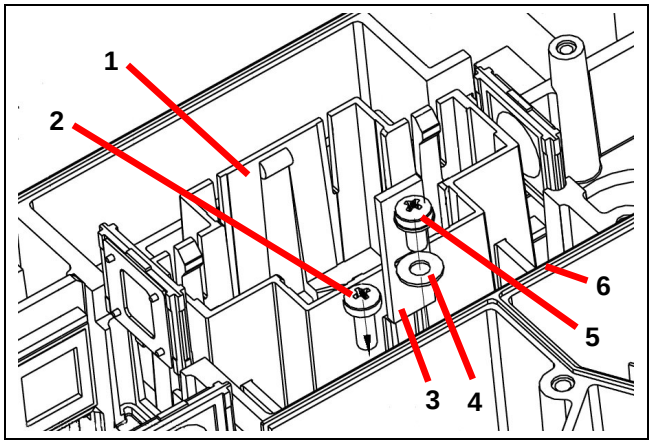


1. Open the photometer (see section 4.1).
2. Remove the beam path (see section 4.4).
3. Open the beam path (see section 4.5).
4. Unplug the reference board (1) from the microprocessor board and remove the lead-through sleeve (2) from the frame bottom (3).
5. Lift the reference board (1) out of the frame bottom (3).

To install the reference board, carry out steps 1 to 5 in reverse order.

CAUTION: The adjustment of the beam path must be checked after the replacement has been carried out!

4.10 50 mm cell compartment



1 - Cell compartment, 50mm (LZV600)

2 - Cross-recessed flat-head screw ISO 7045 - M 3 x 8 (4x)

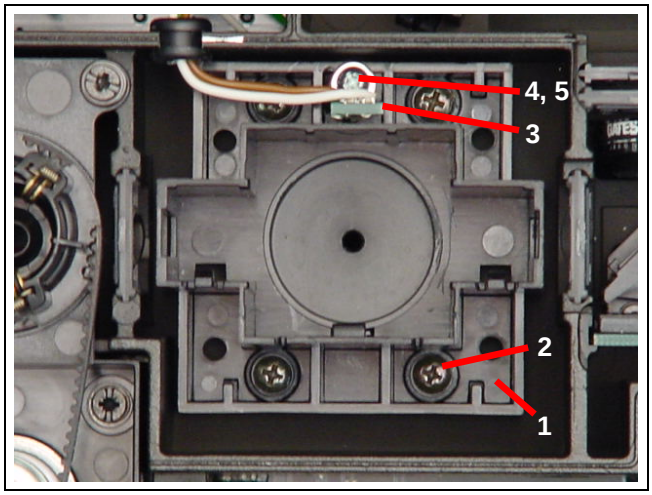
3 - Hall sensor board

4 - Screw for plastic (3.0 x 6), head with flat collar/type Z recess (4x)

5 - Washer ISO 7089 - 3 - 200 HV - A4

6 - Frame bottom

Removing the cell compartment



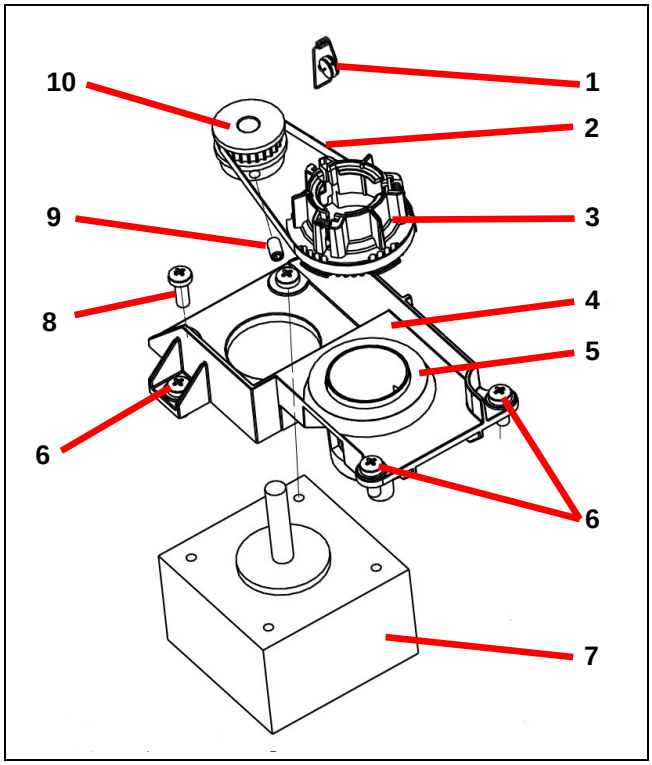
1. Open the photometer (see section 4.1).
2. Remove the beam path (see section 4.4) and unplug the Hall sensor board (3) from the microprocessor board.

   Note: Step 2 is only necessary if the Hall sensor board (3) is to be replaced.
3. Open the beam path (see section 4.5).
4. Remove the four screws (2) and lift the cell compartment (1) out of the frame bottom.
5. Remove the screw and washer (4/5), then remove the Hall sensor board (3) from the cell compartment (1).

To install the cell compartment, carry out steps 1 to 5 in reverse order.

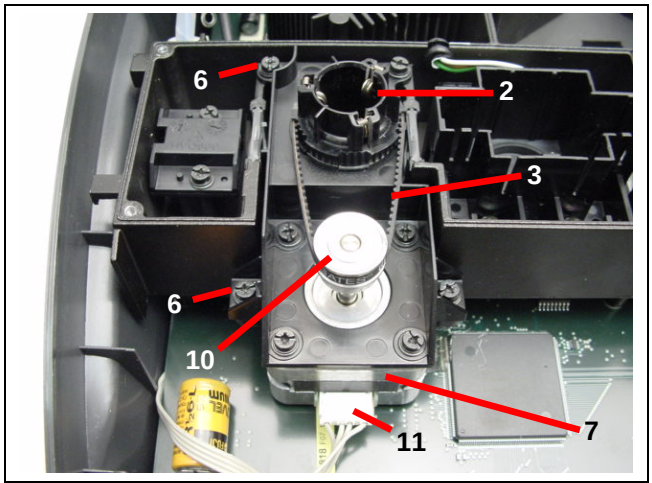
CAUTION: The adjustment of the beam path must be checked after the replacement has been carried out!

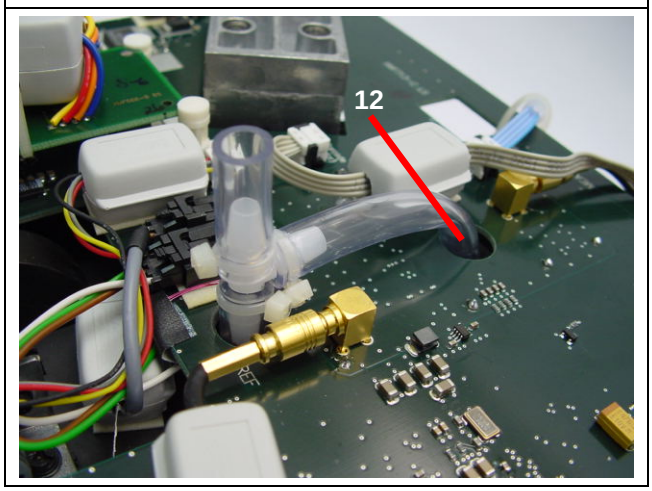
4.11 Round cell compartment with drive



1 - Leg spring, complete (3x)
2 - Toothed belt (LZV594)
3 - Drive ring (A23757, LZV633)
4 - Cell compartment, round (LZV599)
5 - Spacer ring DIN 988 - 20 x 28 x 0,3
6 - Washer-and-screw assembly M3x8-Z1-3-8.8-A2 (4x) (for fastening in the frame bottom)
7 - Stepper motor with connector (A23794)
8 - Washer-and-screw assembly M3x8-Z1-3-8.8-A2 (4x) (for fastening pos. 7 to pos. 4)
9 - Set screw ISO 4029 - M 3 x 4 (locked with Loctite 242)
10 - Belt pulley

Removing the round cell compartment and drive

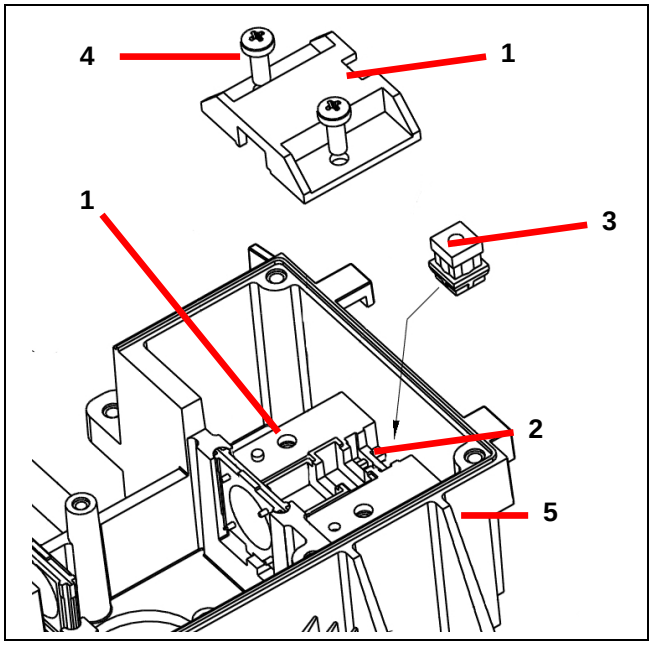




1. Open the photometer (see section 4.1).
2. Remove the display assembly (see section 4.3).
3. Open the beam path (see section 4.5).
4. Pos. 2, 3 or 10 can now be replaced.
5. To replace the stepper motor (7), remove the beam path (see section 4.4).
6. Disconnect the tube (12) from the round cell compartment (4).
7. Disconnect the connector (11) from the stepper motor (7).
8. Remove the four screws (6), then remove the total assembly.

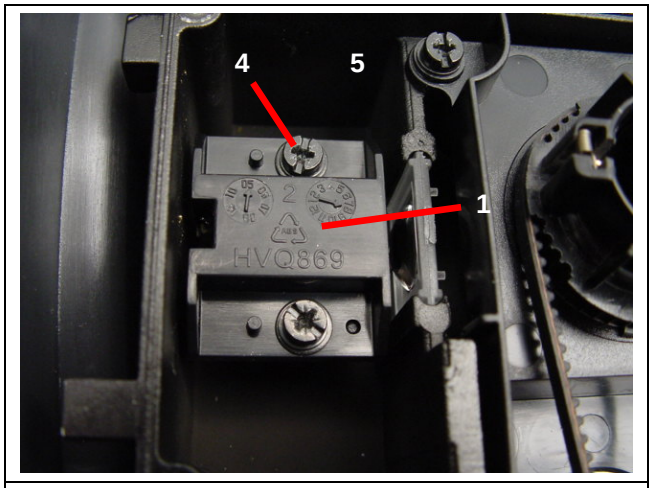
To install the round cell compartment, carry out steps 1 to 8 in reverse order.

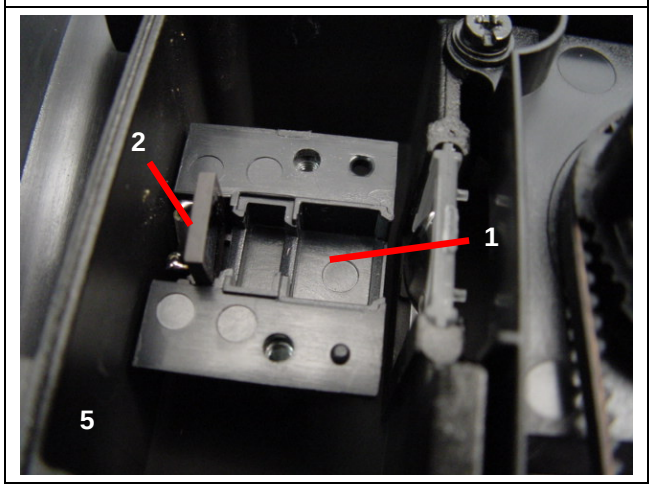
4.12 Measurement sensor



1 - Stray light trap
2 - Measurement sensor (LZV612)
3 - Lead-through sleeve
4 - Washer-and-screw assembly M3x8-Z1 (2x)
5 - Frame bottom

Removing the measurement sensor

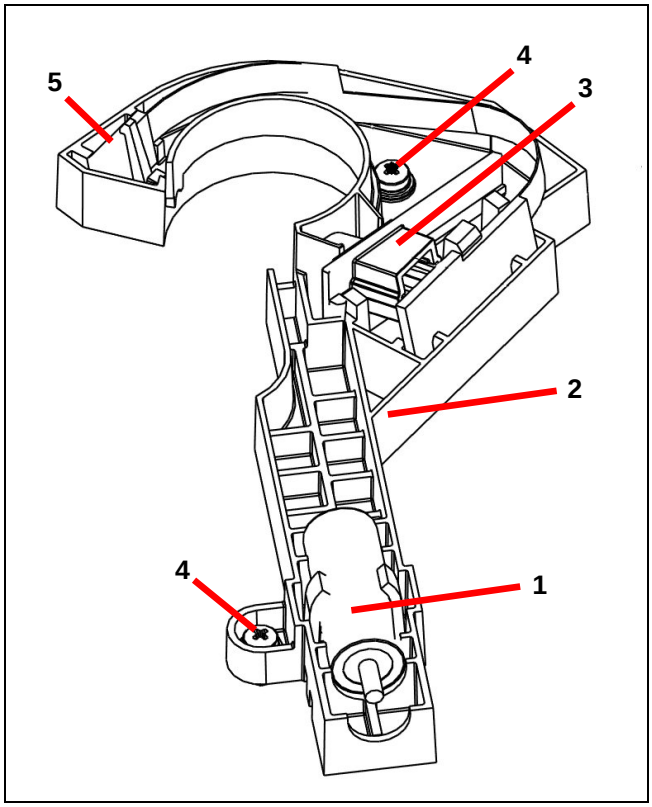




1. Open the photometer (see section 4.1).
2. Remove the beam path (see section 4.4)
3. Unplug the measurement cell (2) from the microprocessor board and remove the lead-through sleeve from the frame bottom.
4. Open the beam path (see section 4.5).
5. Remove the two screws (4) and remove the stray light trap (1) and the measurement sensor (2) from the frame bottom (5).

To install the measurement sensor, carry out steps 1 to 5 in reverse order.

4.13 Barcode reader



1 - Laser module 650nm; 0.3mW with connector (LZV524), class 1 laser

2 - Cover

3 - Optics holder

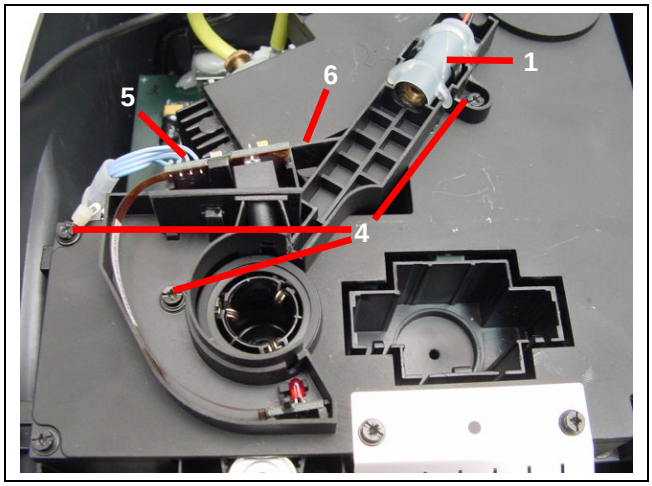
4 - Washer-and-screw assembly M3x8-Z1-3-8.8-A2 (2x) (for fastening pos.2 to the frame bottom)

5 - Barcode sensor board (YAB080)

Note: Pos. 1, 2, 3 and 5 are collected together as one spare part in the barcode reader:

- LZV658 for LPG422.99.0001x
- LZV664 for LPG422.99.0000x

Removing the barcode reader



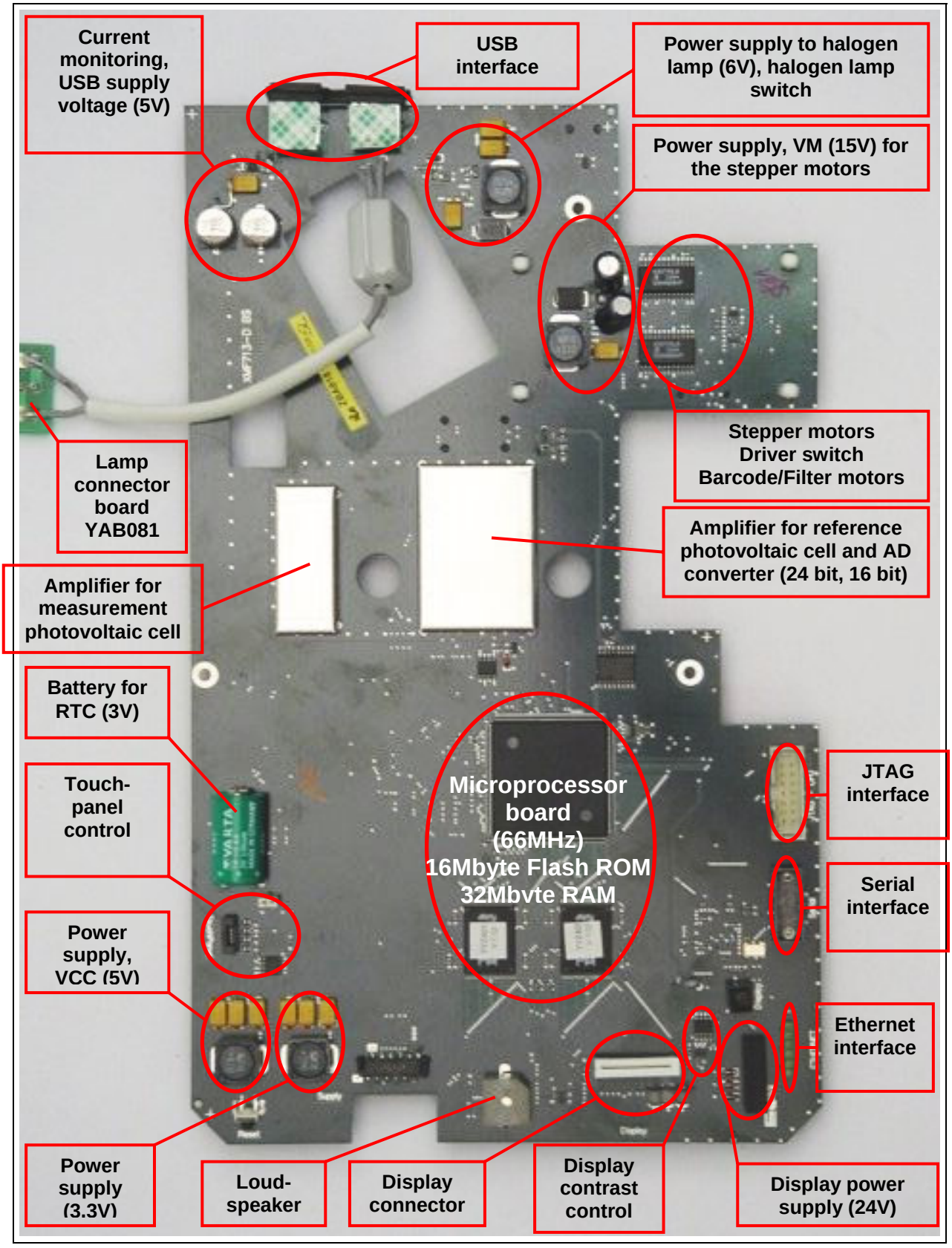
1. Open the photometer (see section 4.1)
2. Remove the beam path from the housing bottom (see section 4.4)
3. Unplug the laser module (1) and the barcode sensor board (5) from the microprocessor board.
4. Remove the three screws (4), then remove the barcode reader LZV658 (6).

To install the barcode reader, carry out steps 1 to 4 in the reverse order.

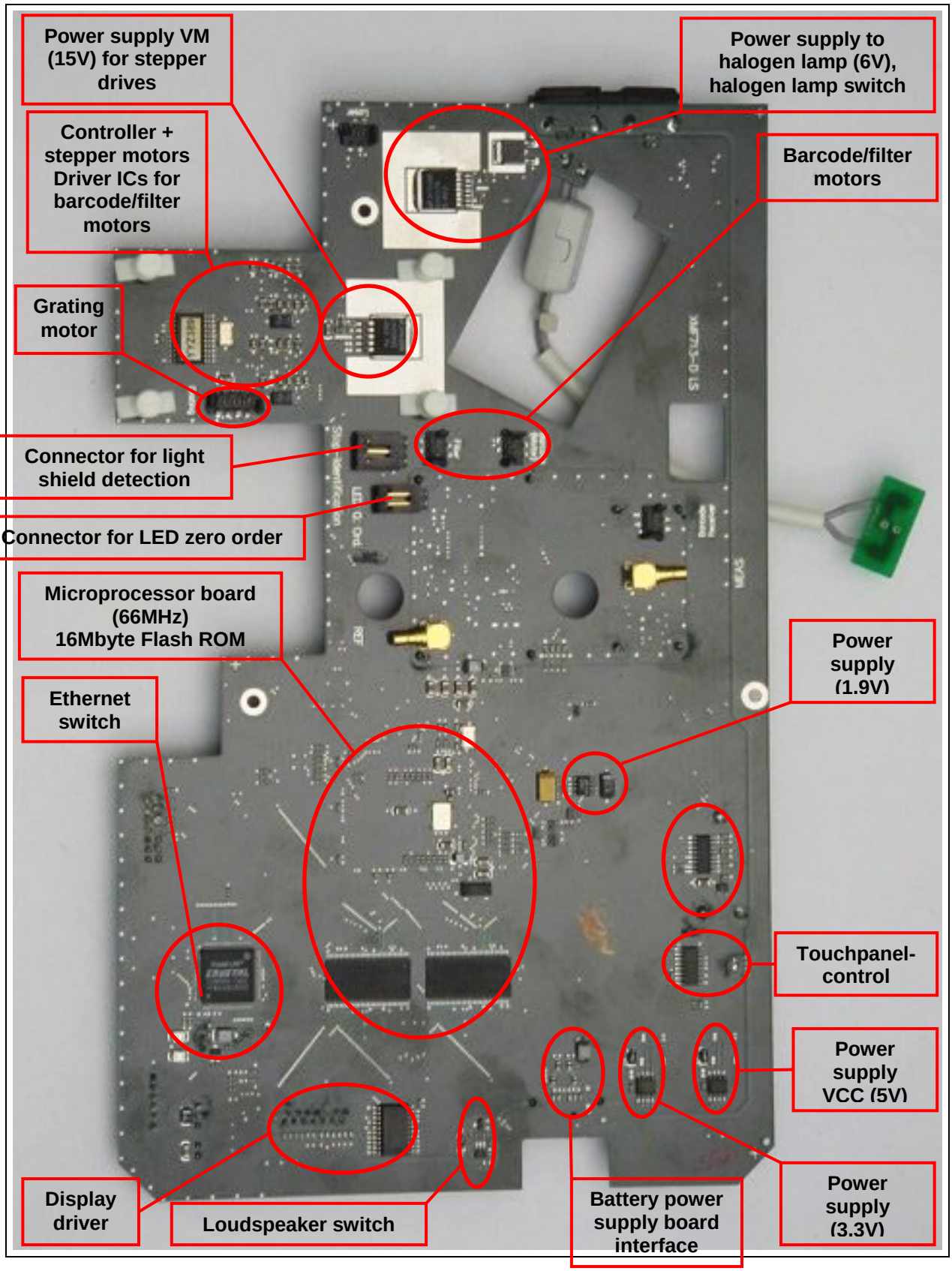
Safety information: A class 1 laser is installed in this photometer. Class 1 lasers are safe for use under normally predictable operating conditions. Optical instruments can be used to observe the beam directly. Data: 0.3 mW; λ= 650 nm

4.14 Microprocessor board

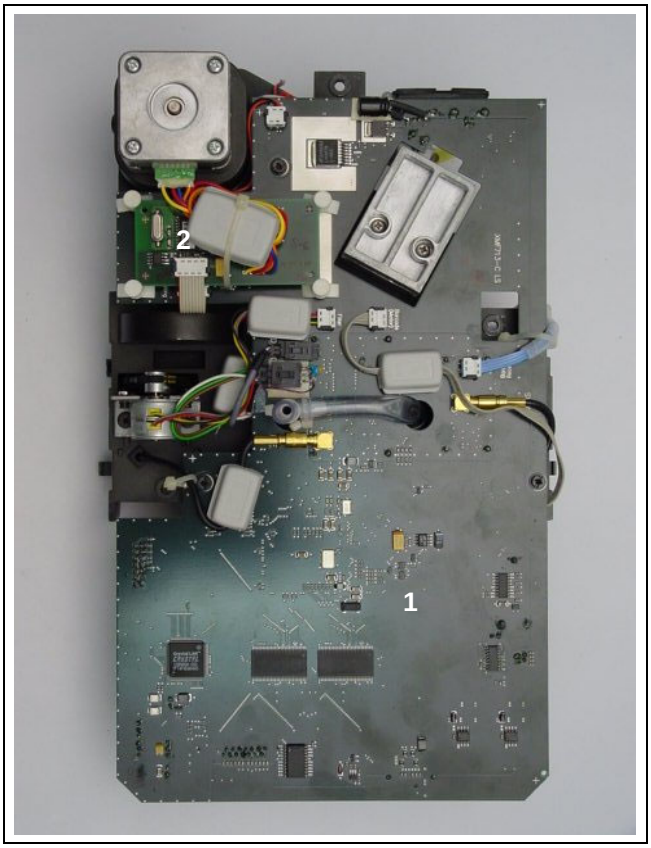
Configuration of the microprocessor board


Current monitoring, USB supply voltage (5V)
USB interface
Power supply to halogen lamp (6V), halogen lamp switch
Power supply, VM (15V) for the stepper motors
Stepper motors Driver switch Barcode/Filter motors
Lamp connector board YAB081
Amplifier for reference photovoltaic cell and AD converter (24 bit, 16 bit)
Amplifier for measurement photovoltaic cell
Battery for RTC (3V)
Touch-panel control
Microprocessor board (66MHz) 16Mbyte Flash ROM 32Mbvte RAM
JTAG interface
Serial interface
Power supply, VCC (5V)
Ethernet interface
Power supply (3.3V)
Loud-speaker
Display connector
Display contrast control
Display power supply (24V)

Solder side of the microprocessor board


Power supply VM (15V) for stepper drives
Power supply to halogen lamp (6V), halogen lamp switch
Controller + stepper motors Driver ICs for barcode/filter motors
Barcode/filter motors
Grating motor
Connector for light shield detection
Connector for LED zero order
Microprocessor board (66MHz) 16Mbyte Flash ROM
Power supply (1.9V)
Ethernet switch
Touchpanel-control
Power supply VCC (5V)
Power supply (3.3V)
Display driver
Loudspeaker switch
Battery power supply board interface

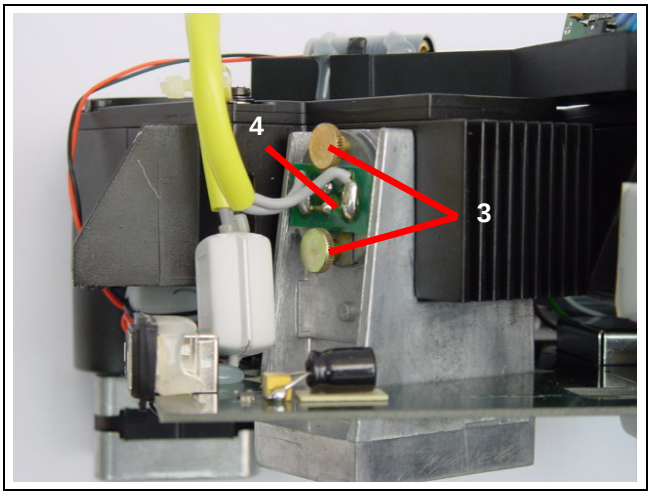
Removing the microprocessor board



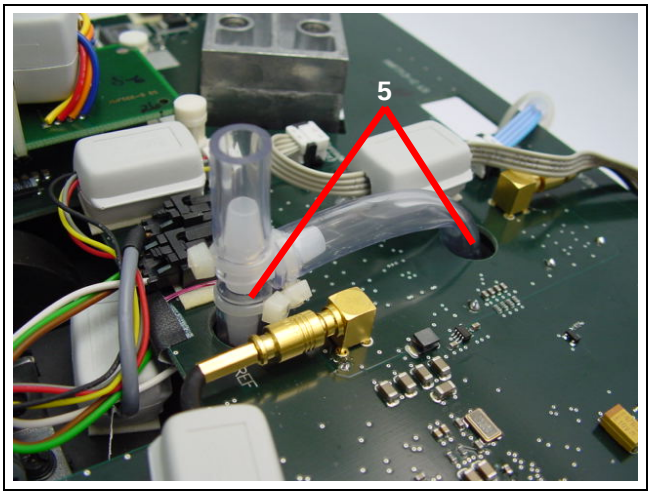
1 - Microprocessor board (YAB077/YAB051)

2 - Grating motor board

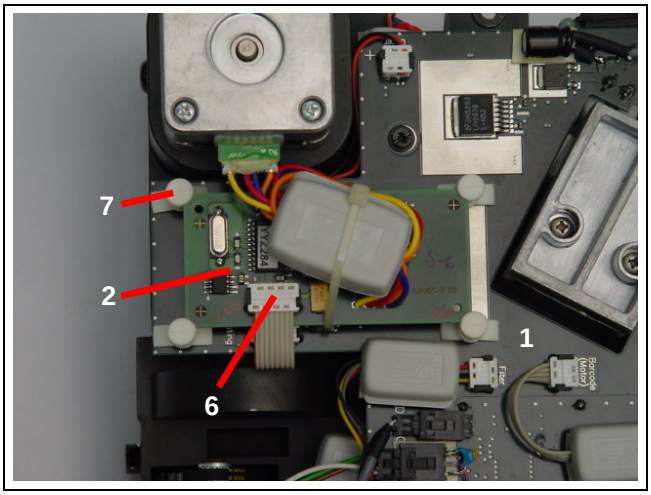
1. Open the photometer (see section 4.1).
2. Remove the beam path (see section 4.4).



3. Loosen the two knurled screws (3) and disconnect the lamp socket board YAB081 (4) from the halogen projection lamp.



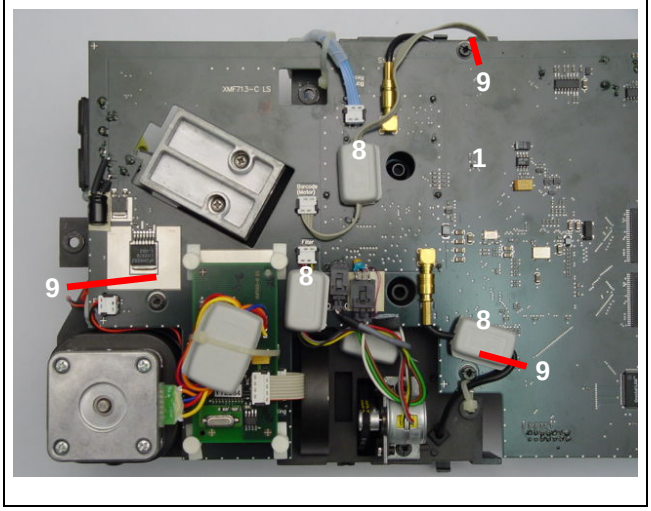
4. Disconnect the tube (5) from the frame bottom.



5. Disconnect the connector (6) from the grating motor board (2).

   Note: Always use the Lumberg AZ30 tongs to remove the connector (6)!

6. Push the spacer pins (7) out of the way and remove the grating motor board (2) from the microprocessor board (1).

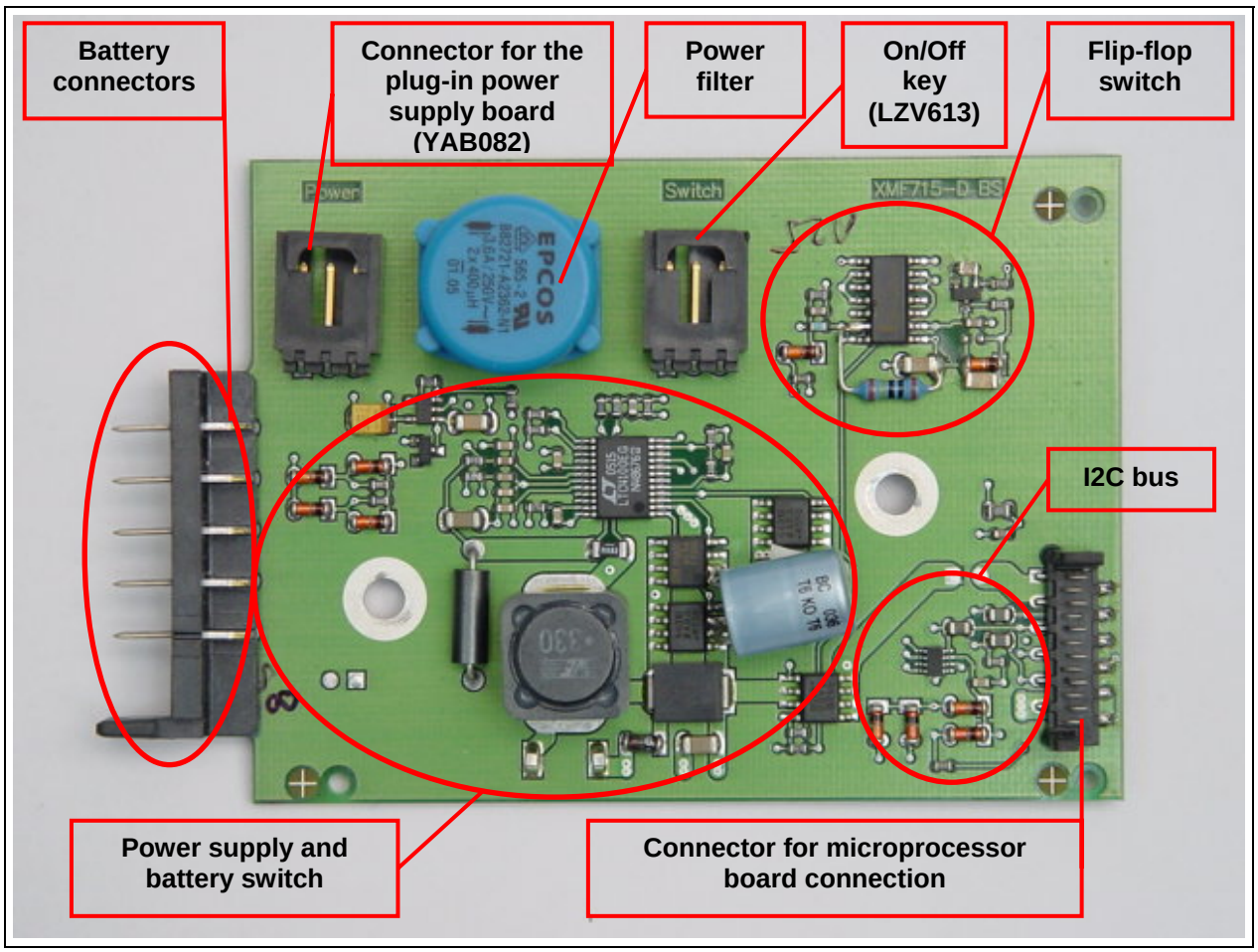


7. Disconnect all connectors and ferrites (8) from the microprocessor board.
8. Remove the three screws (9), then remove the microprocessor board (7) from the frame bottom.

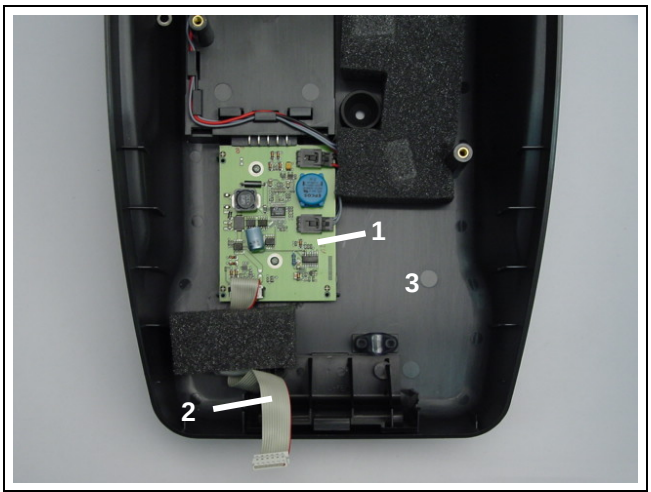
To install the microprocessor board, carry out steps 1 to 8 in the reverse order.

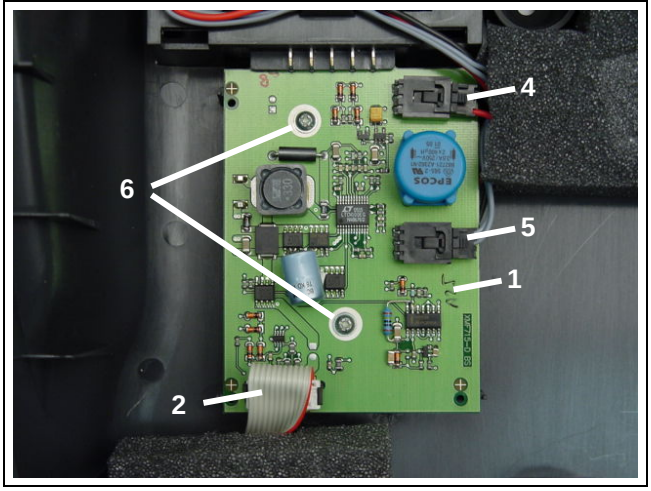
Note: Only the test program is present on the spare microprocessor board. After the microprocessor board has been replaced, the user program and the test databases must be updated (see section 3.9.6 Update)!

4.15 Battery power supply board



Removing the battery power supply board





1 - Battery power supply board (YAB078)

2 - 12-pin connector, micromodule (ZCA851) to microprocessor board

3 - Housing bottom (LZV596)

4 - Connector for plug-in power supply board (YAB082)

5 - Push button connector (LZV613)

6 - Screw for plastic (3.0 x 6), head with flat collar/type Z recess

1. Open the photometer (see section 4.1)
2. Remove the beam path (see section 4.4)
3. Disconnect connectors 2, 4 and 5 from the power supply board (1).

   Note: Always use the Lumberg AZ30 tongs to remove the connector (2)!
4. Remove the two screws (6) and remove the power supply board (1) from the housing bottom (3).

To install the power supply board, carry out steps 1 to 4 in the reverse order.

5 Adjusting the beam path

5.1 General

The lenses used in the DR2800 are made of plastic. They cannot be cleaned. Dust can only be removed with oil-free compressed air or by using bellows.

To carry out the adjustment as it is performed in production, the following steps should be worked through in sequence. This will ensure that the beam path is optimally aligned.

For service purposes, a quick adjustment can be made. If individual components are removed or replaced, only the replaced components need to be adjusted. To do this, the beam position is correctly set to the optical element that follows the element that is to be adjusted.

Tip: If all the optical components are to be taken out of the beam path, it is advisable to proceed step by step (remove, clean, reinstall, adjust ... next element, etc.), starting with the lamp housing, through to the measurement sensor.

5.2 Aids

- VAA643 Spacer gauge for grating
- VAA646 Adjustment device for the beam splitter
- VAA606 Installation aid for fixing the grating
- HRE014 Eccentric pin
- Narrow strip of paper
- Loctite 242 (as threadlocker; see notes in text)

Optional:

VAA042 Adjustment cuvette for 10 mm cuvette

VAA267 Observation screen for 50 mm cuvette

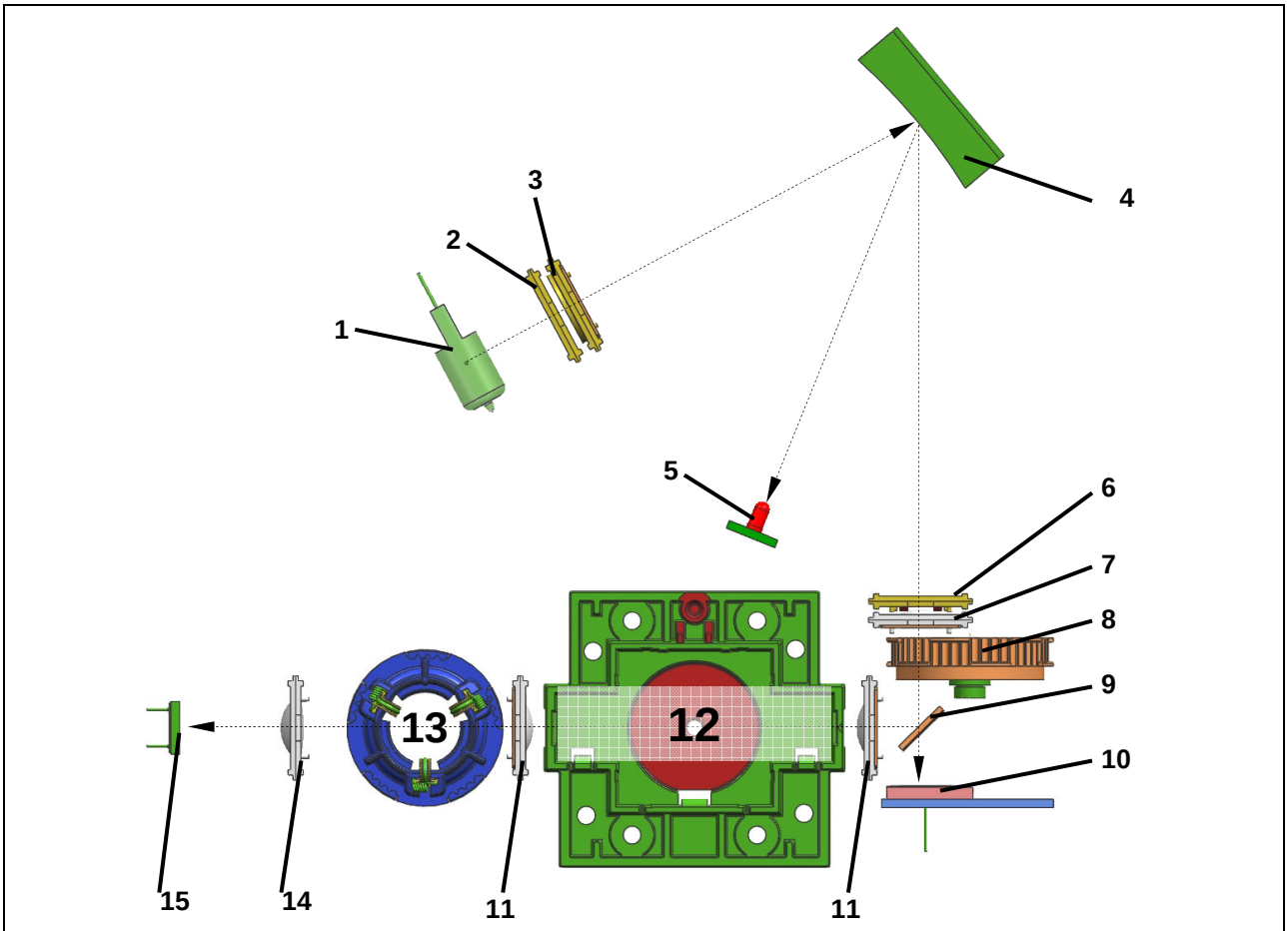
5.3 Preparation

- Open the photometer (see section 4.1)
- Remove the beam path (see section 4.4) (Only necessary if the complete grating assembly is to be removed)
- Open the beam path frame (see section 4.5)
- Switch on the photometer and select the customer service menu [Factory Service]. (See section 3.5)

5.4 Prerequisite

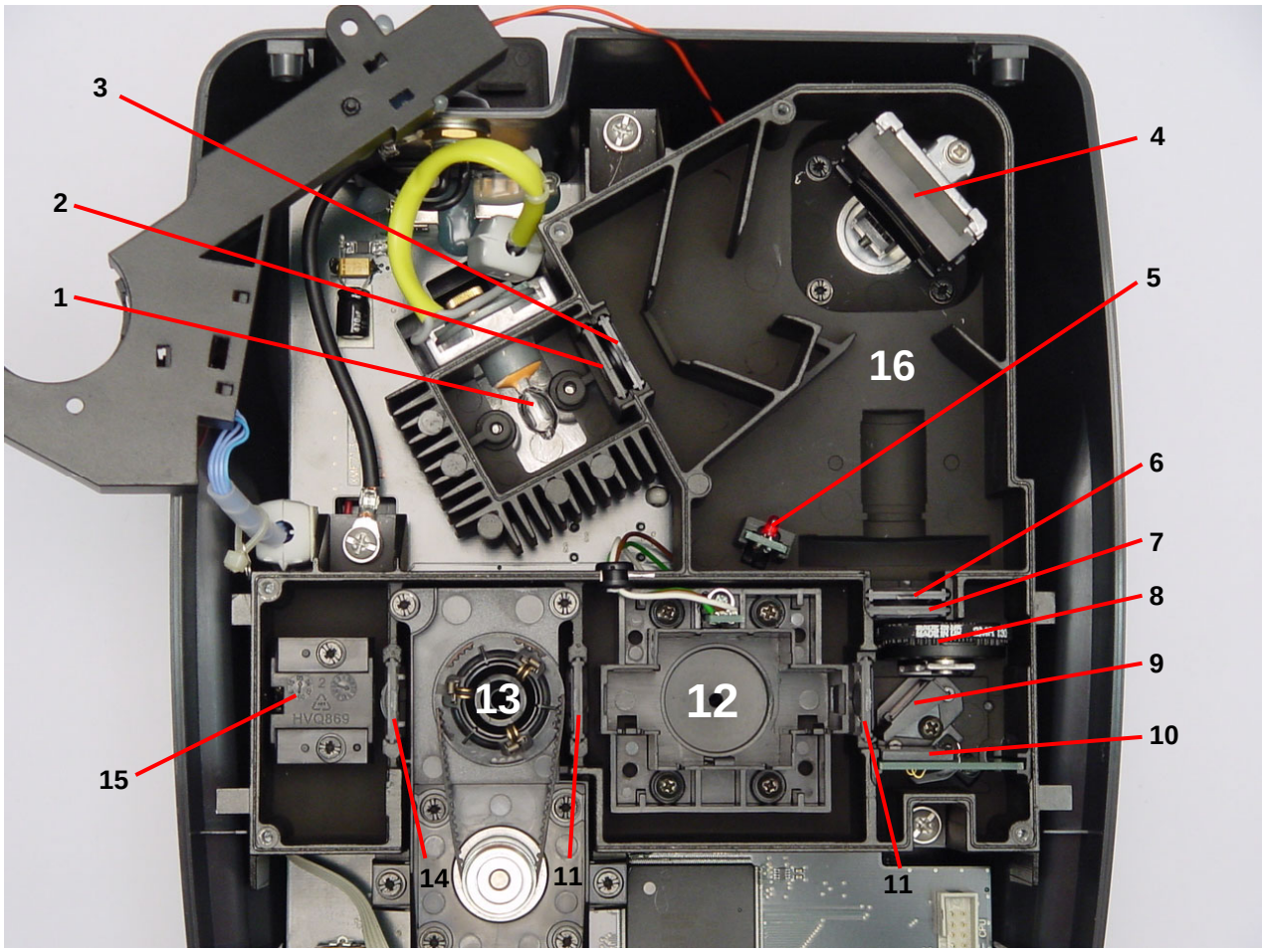
All lenses and aperture plates are in position.

Layout of the components of the beam path – schematic diagram



1 - Halogen projection lamp (LZV565)
2 - Lamp aperture plate
3 - KG2 glass holder, complete
4 - Concave grating (LZV592)
5 - LED board (ZBA830)
6 - Slit holder, complete
7 - Lens B (included in LZV587)
8 - Filter wheel with filters (LZV591)
9 - Beam splitter mirror, mounted (LZV590)
10 - Reference board (YAB083)
11 - Lens A (included in LZV587)
12 - 50 mm cell compartment (LZV600)
13 - Round cell compartment (LZV599)
14 - Lens C (included in LZV587)
15 - Measurement sensor (LZV612)

Layout of the components of the beam path – photo

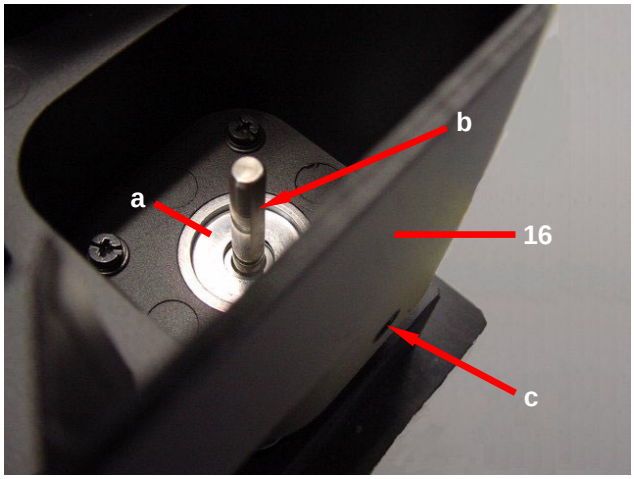


1 - Halogen projection lamp (LZV565)
2 - Lamp aperture plate
3 - KG2 glass holder, complete
4 - Concave grating (LZV592)
5 - LED board (ZBA830)
6 - Slit holder, complete
7 - Lens B (included in LZV587)
8 - Filter wheel with filters (LZV591)
9 - Beam splitter mirror, mounted (LZV590)
10 - Reference board (YAB083)
11 - Lens A (included in LZV587)
12 - 50 mm cell compartment (LZV600)
13 - Round cell compartment (LZV599)
14 - Lens C (included in LZV587)
15 - Measurement sensor (LZV612)
16 - Frame bottom

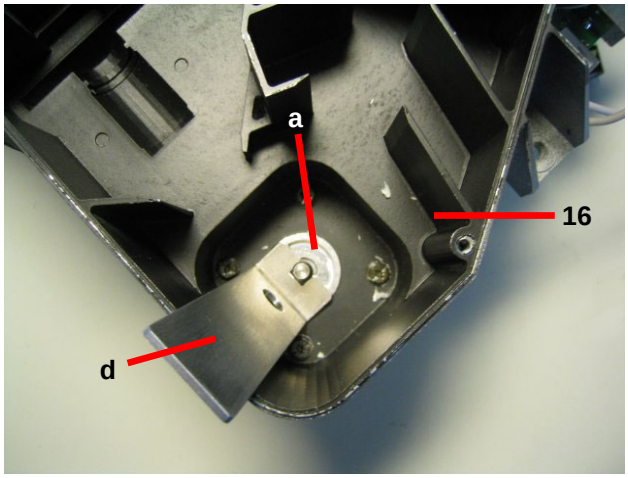
5.5 Adjusting the beam path

Grating

Note: In contrast to the other sections of this manual, letters are used here to identify some components. This allows the optical components to be given the same numbers as in the “Layout of the components of the beam path" on pages 5, 67 and 68).

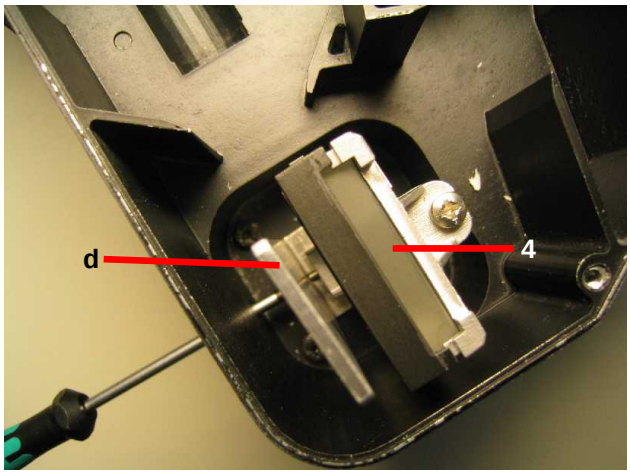


1. The shaft of the grating motor (a) must be positioned with the milled (b) side facing the hole (c) in the frame bottom (16).

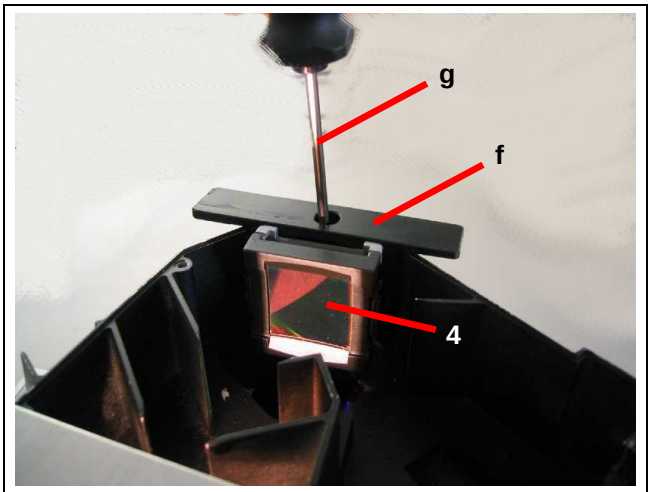


2. Adjust the height of the grating (4) by pushing the VAA643 (d) together with the grating/grating holder (4) onto the shaft of the grating motor (a) until the base of the shaft is reached. The optically active area of the grating (4) should face the hole (c) in the frame bottom (4).

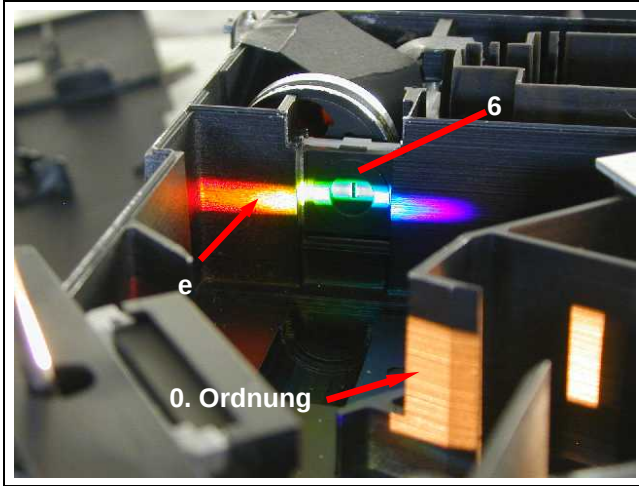
CAUTION: Do not touch the optical surface!



3. Tighten the set screw (recommended torque 0.5 Nm). The set screw is then in contact with the milled area of the motor shaft and must be locked with Loctite 242.
4. Return the beam path to the frame bottom.
5. In the test program, select the ‘Adjust’ menu (see section 3.7.5).
6. Switch the lamp on (see section 3.7.5).

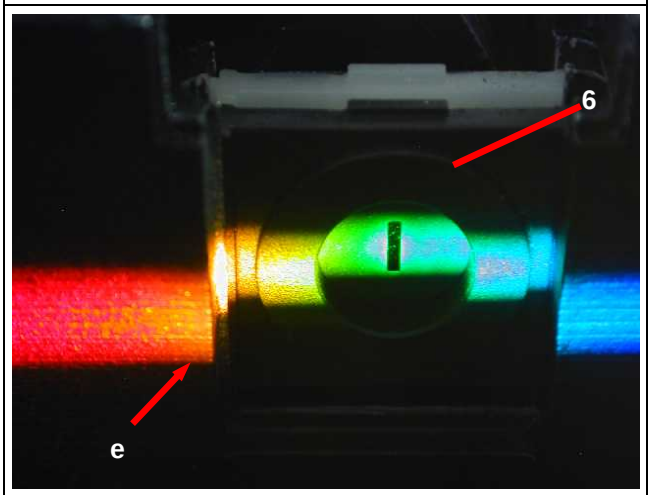


7. Position the grating (4) (see section 3.7.5, menu item ‘Grating’) so that the green light of the first order spectrum (e) falls on the exit slit (6).



8. Use a screwdriver (g) to turn the adjustment screw until the light falls evenly above and below the exit slit (6).

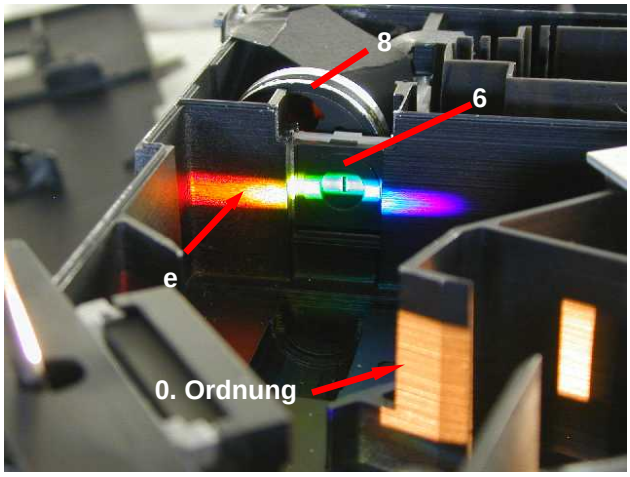
   Note: The installation aid VAA606 (f) can be used to fix the grating (see illustration), but **must** be removed before the next steps are carried out.



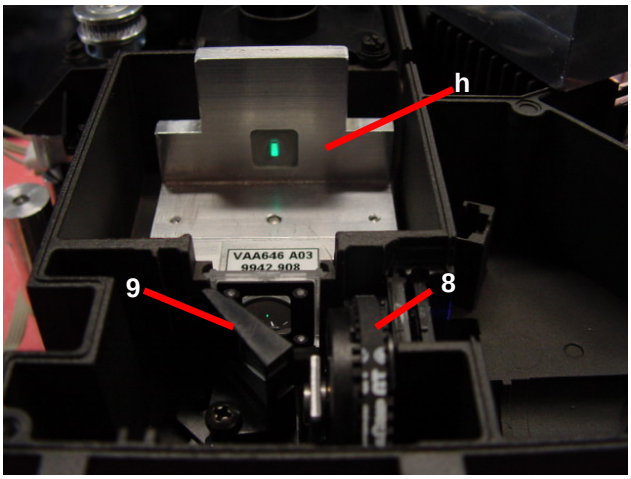
9. Check the adjustment by turning the grating so that it faces the lamp. The reflected light should strike the lamp at the same height → the light should fall evenly above and below the aperture of the KG glass!

   Note: If the reflection does not fall evenly over the aperture, the height adjustment of the grating (VAA643) was not successful and must be repeated!

Beam splitter



10. Position the grating (4) again so that the green light of the first order spectrum (e) falls on the exit slit (see page 70). Then rotate the filter wheel (8) (see section 3.7.5) until the green light falls on the beam splitter (9). The light **must** pass through the centre of the filter, i.e. it must not be cut off above or below. The easiest way to check this is with a piece of paper.

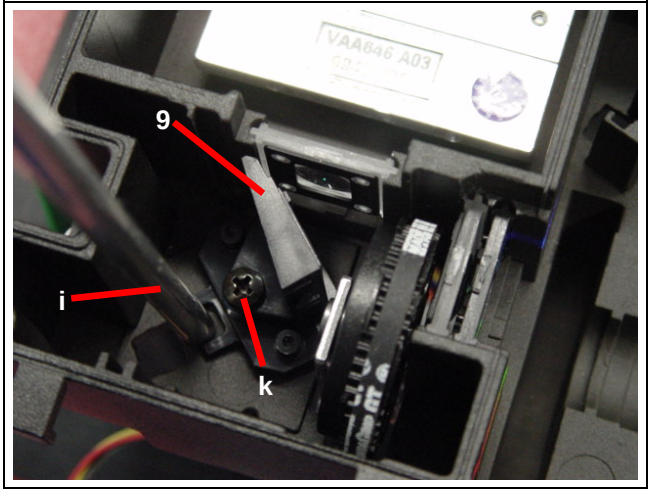


11. The VAA646 (h) can now be mounted in the position of the 50 mm cell compartment (12). The beam must fall on the centre of the screen of the VAA646.

    This can be achieved by tilting and turning the beam splitter (9):

    The eccentric pin (i) is responsible for the lateral adjustment of the beam splitter (9) and fixes the beam splitter when it is screwed tight. The only central screw (k) is to adjust the height.

12. If the light falls centrally on the VAA646 (h) and the beam path (9) is firmly screwed in place, a check must be carried out to ensure that the beam falls centrally on all the lenses (use a piece of paper). Then mount the reference-photovoltaic cell (15) and check whether the beam falls satisfactorily on the active area.



13. The remaining components can now be mounted.

    Finally the VAA042 and VAA267 can be used to check the path of the beam in the rectangular cell compartment again.

6 Inspection

6.1 Inspection procedure

What?	How?
Check the housing for damage and/or soiling.	Visual check
Update to the latest version using the user program	Version number in the user program -> System checks -> Instrument information Update in the user program -> System checks -> Instrument update (see section 3.9.6)
Clean the following components of the photometer:	
Lenses	Clean using method: 1
Filter (in filter wheel)	Clean using methods: 1, 2, 3, 4a
Sensor with window	Clean using method: 1
Caution: The grating must not be cleaned; if it becomes soiled it must be replaced!	

Method 1: Cleaning with air: Settled dust can be blown off with a rubber bellows or an oil-free air gun or ionization gun.

Method 2: Cotton swabs: Dust particles can be carefully removed from small parts with a cotton swab if cleaning with air does not succeed.

Method 3: Optical cleaning cloth: Dust particles can be removed from larger parts by careful use of an optical cleaning cloth.

Method 4: Damp cleaning: For slightly greasy soiling:

a) Breath lightly on the surface of the part and then clean it carefully with an optical cleaning cloth or cotton swabs.

6.2 Hardware check (Adjust)

6.2.1 General

The hardware check can be used to test essential functions and parts of the spectrophotometer. This is a menu-guided test program, which carries out a self-diagnosis of the DR2800. The user is guided through the program step by step.

Section 3.10.1 Hardware Check (Adjust) describes how to start the hardware check.

6.2.2 Aids

- USB – Connecting cable (Host/Device) (XLH926)
- LZV551 – Battery (12V)
- LZV610 – Plug-in power supply (15V/2A)
- VAA591 – Validation Kit

6.2.3 Tests

Insert the battery (LZV551) into the photometer. Connect both ends of the USB cable (XLH926) to the instrument. Connect the plug-in power supply (LZV610) to the photometer. Switch on. In the **test program**, select **Inspection** and then **Hardware Check (Adjust)**.

1. Initialization including resetting all calibration values

   Press the **Start** key. A prompt appears, asking whether “Hardware Adjust” should be carried out. Confirm this by touching the **OK** key. A **Start** key appears. Touch this to start the test:

2. Touchscreen adjustment and position test

   Touch the displayed cursor crosses.
   The position test menu is then displayed automatically.
   Touch Return to proceed to:

3. Display contrast

   The following adjustments or tests can be carried out here:

   - Pixel test
   - Display adjustment (dark)
   - Display adjustment (bright) and
   - Display control on/off
   - Backlighting on/off

   Touch Return. A confirmation message is displayed.

4. Test sound

   A short acoustic signal sounds 3 times and a confirmation message is again displayed.

5. Set RTC

   If necessary, the RTC can be set. A confirmation message is again displayed. A battery test is also carried out.

6. USB Test (Host/Device)

   Connect both ends of the USB cable (XLH926) to the instrument. A check is carried out to determine whether both ports function correctly.

7. Test I/O push button

   The I/O push button is checked to ensure it is not short circuiting.

8. Battery test

   Insert the battery (LZV551) in the photometer. A check is carried out to determine whether the battery communicates with the photometer and reports correct parameters. A check is also carried out to ensure that the plug-in power supply (LZV610) is connected to the photometer.

9. Calibration of cuvette detection

   The round-cuvette detection of the photometer is calibrated. A round cuvette must not be inserted.

10. Read barcode

    The instrument prompts for the barcode round cuvette VAA044 to be inserted. Insert the round cuvette and confirm by touching **OK**. The VAA044 is read three times. Another barcode cuvette can be inserted instead of the VAA044; a message is displayed showing the barcode of this other cuvette, thus enabling the correct functioning of the reader to be verified.

11. Calibration of the beam path with standard values

    An initial photometric calibration of the photometer is carried out. The default values are used for all instrument parameters.

12. Test dark values of reference channel/measurement channel:

13. Functioning of the reference and measurement potentiometer

    The functioning of the reference and measurement potentiometer is tested at setting 90 and setting 45. The measured value must fall by 30% at 900nm. A reference and measurement channel potentiometer adjustment is then carried out for all filters. A check is carried out to determine whether the voltage reaches +/- 0.4V.

Wavelength	Filter number	Measurement voltage	Reference voltage
805nm	F4	3.0V	3.8V
580nm	F3	3,0V	3.8V
390nm	F2	1.7V	2.1V
360nm	F1	1.2V	1.5V

14. Adjustment of the level of the zero order LED

15. New calibration of the beam path

    A second photometric calibration of the instrument is performed, using the instrument parameters set by the previous calibration.

16. Set factor/offset for the measurement channel

    The relationship between the 16-bit and the 24-bit AD converters of the measurement channel is adjusted.

17. Grating adjustment with monochromator angle measurement

    A BG20/2 test filter is needed. This has to be positioned in the rectangular cell compartment of the photometer. The monochromator angle of the photometer is adjusted using this test filter.

18. Test light shield detection:
    The photometer's light shield adapter must be inserted and should remain in place for the following air values scan.

19. Air values measurement
    Scan the total wavelength range once with the lamp switched off (dark) and once with the lamp switched on (bright). The absorbance value calculated in each case is saved as the zero value. Assessment of the measurement/reference signals without lamp < 0.050V. The AD converter (24 bit) must respond both with and without the lamp. The calculated absorbance value must be <= 0.250 over the total wavelength range.

20. Check air values

    Another scan is carried out from 340 to 400 nm. The absorbance value from step (18) must be obtained within ± 5.4 mAbs. The wavelengths 360nm, 380nm, 440nm, 580nm and 805nm are again set and a measurement is carried out at each of them. In this case the absorbance value from step (18) must be obtained within ± 3 mAbs.

21. Test battery operation of the photometer:
    The photometer is finally operated without the plug-in power supply (LZV610), thus testing its operation with the battery only (LZV551).

22. Switch off the photometer:
    The photometer is switched off using the instrument's software.

6.3 Service inspection

6.3.1 General

The service inspection program is used to perform a photometric test with test filters during a service session. This is a menu-guided program. The user is guided through the program step by step.

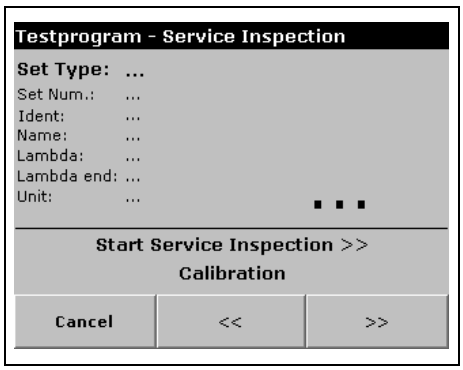
Section 3.10.2 Service Inspection describes how to start the service inspection program.

6.3.2 Aids

- VAA608 – USB memory stick with DR2800 test program
- VAA591 - Validation kit
- LZV610 - Plug-in power supply (15V/2A)

6.3.3 Tests

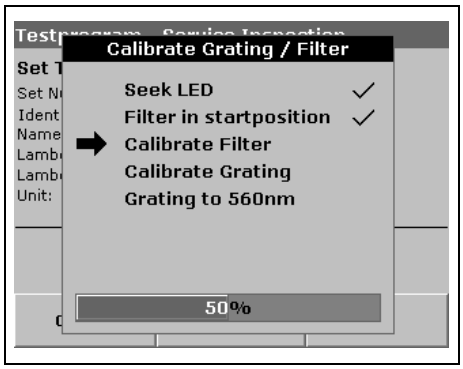
The optical system is tested with test filters. The necessary test filters are components of the VAAs named in section 6.3.2. The menu-guided test program prompts the user to insert specific filters.



Call the Service Inspection program (see section 3.10.2 Service Inspection).

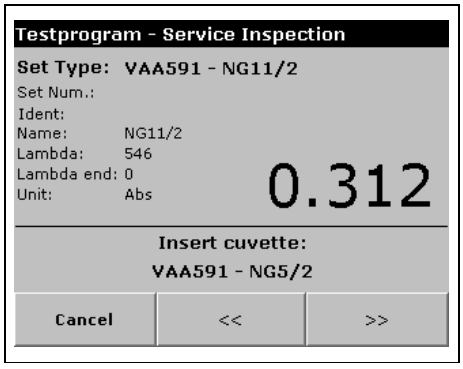
In the central zone of the window is a two-line status field, where the program status and all instructions are displayed.

Touch the '>>' key to start the test.

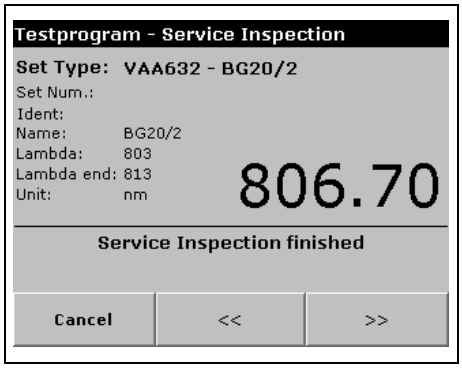


The instrument is first calibrated. If an error occurs during the calibration, the calibration must be repeated or the program must be cancelled.

After the calibration has been completed successfully, the photometer inspection can be continued. The measurement that is to be carried out is displayed in the status field. Press the '>>' key to start.



When the measurement procedure has been completed, the measurement result and the associated parameters are displayed in the upper zone of the window.



When all the measurements have been carried out in accordance with the test specification, the message 'Service Inspection finished' appears in the status field.

Press the '>>' key to end the test program.

The 'Inspection' menu appears again in the window. The photometer can then be switched off and the USB memory stick (VAA608) can be unplugged.

Explanation of the error messages:

Menu item	Explanation
USB not accessible	USB memory stick (VAA608) cannot be accessed
Error on reading instructions	Error on reading the test protocol Are the directory and specifications with FinalInspection.csv file present (on the USB memory stick)?
Error... please cancel...	Possible storage error
Could not open <filename>	File could not be opened USB memory stick not OK? File deleted?
Wrong version! Program x.xx, File x.xx	Finalinspection.csv and the test program have different version numbers. The version number in front of the point differs → obtain a new test program or another Finalinspection.csv file.
Wrong scan range	The scan range in the test instructions is wrong. Request corrected Finalinspection.csv file.

7 Technical documentation, circuit diagrams and component mounting plans

The file Anhang_ Serviceanleitung_DR2800.zip, which is supplied together with the Service Manual, contains the technical documentation of the complete photometer and the circuit boards.

Content of Anhang_Serviceanleitung_DR2800.zip:

Part no.	Part description
LPB422	Block diagram, DR2800
LPG422	DR2800
ZBA818	Microprocessor board
ZBA820	Battery power supply board
ZBA822	Barcode board
ZBA830	LED board
ZBA832	Plug-in power supply board
ZBA835	Reference board

8 Spare parts

The position numbers can be found in the diagram of the LPG422.

Drive ring for round cuvette, 16/13 mm

Order no.: A23757 Pos. 65

Stepper motor for barcode

Order no.: A23794 Pos. 63

Lithium battery (buffer)

Order no.: LZP659

Bumper feet

Order no.: LZV400 Pos. 165

Laser module
(only for LPG422.99.0000x)

Order no.: LZV524 Pos. 94

Lithium battery

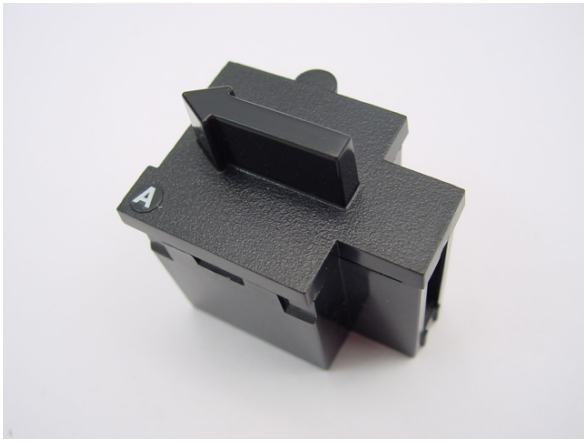
Order no.: LZV551

Halogen lamp

Order no.: LZV565 Pos. 6

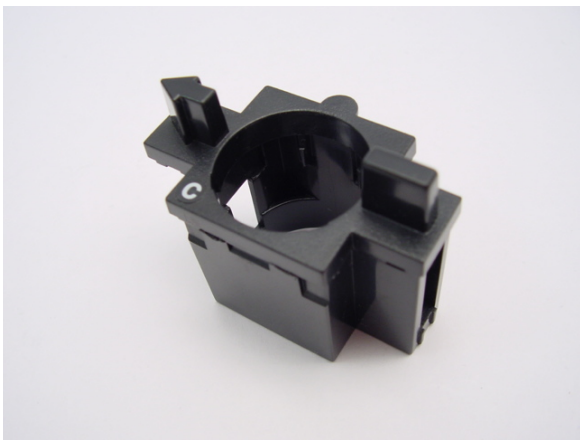
Cell adapter A, 10 mm

Order no.: LZV583



Cell adapter C, 1 inch

Order no.: LZV584



Cell adapter B, pour-thru cell

Order no.: LZV585

Set of lenses

Order no.: LZV587 Pos. 43/57/73

“HACH LANGE” housing top

Order no.: LZV588 Pos. 150

“HACH” housing top

Order no.: LZV589 Pos. 150

Beam splitter mirror, mounted

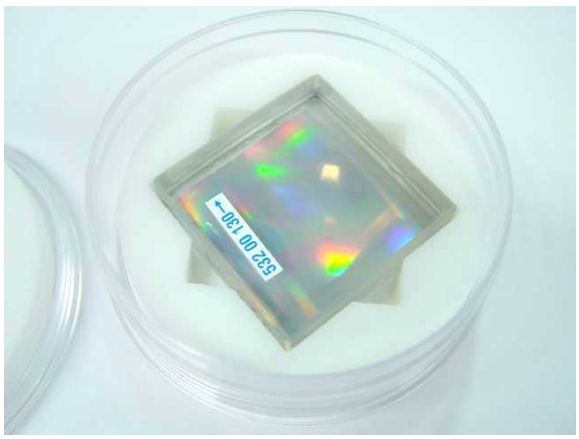
Order no.: LZV590 Pos. 50

Filter wheel with optical filters

Order no.: LZV591 Pos. 18

Concave grating

Order no.: LZV592 Pos. 31



Tooth belt for filter changer

Order no.: LZV593 Pos. 20

Tooth belt for barcode unit

Order no.: LZV594 Pos. 71

Battery cover

Order no.: LZV595 Pos. 160

Housing bottom

Order no.: LZV596 Pos. 100

“HACH” casting resin nameplate

Order no.: LZV597 Pos. 155

“HACH LANGE” casting resin nameplate

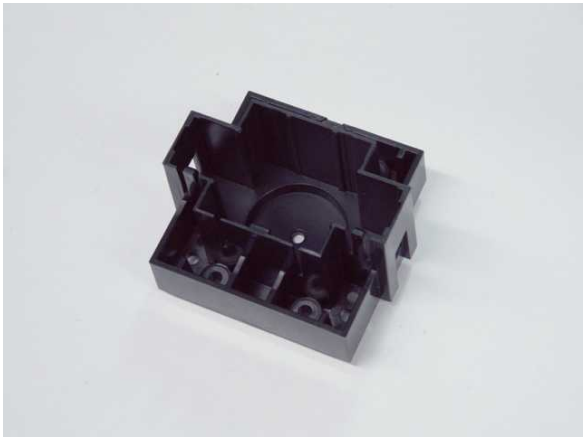
Order no.: LZV598 Pos. 155

Cell compartment, round

Order no.: LZV599 Pos. 60

Cell compartment, 50 mm

Order no.: LZV600 Pos. 58



Tubing

Order no.: LZV601 Pos. 180/181

Belt pulley for filter changer

Order no.: LZV602 Pos. 17

Belt pulley for barcode unit

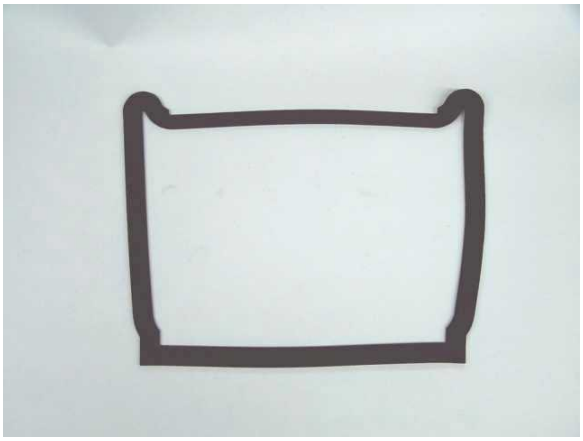
Order no.: LZV603 Pos. 70

Catch

Order no.: LZV604 Pos. 105

Sealing for display frame

Order no.: LZV606 Pos. 143



Cap for USB

Order no.: LZV607 Pos. 120

Knurled screw

Order no.: LZV608 Pos. 301

Display frame

Order no.: LZV609 Pos. 139

Plug-in power supply

Order no.: LZV610

Touch screen, complete

Order no.: LZV611 Pos. 135/136

Measurement sensor

Order no.: LZV612 Pos. 78

Push button
(only for LPG422.99.0000x)

Order no.: LZV613 Pos. 118

Stepper motor for filter changer

Order no.: LZV614 Pos. 16

O-ring, 10x1.5, for fixing the grating

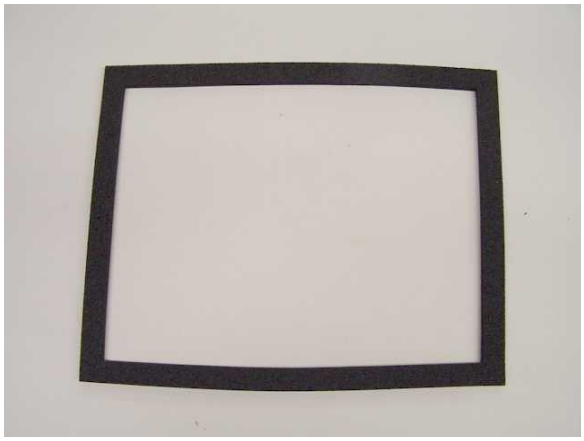
Order no.: LZV663 Pos. 35

Protective cover

Order no.: LZV642

Sealing for display

Order no.: LZV643 Pos. 55



Light shield

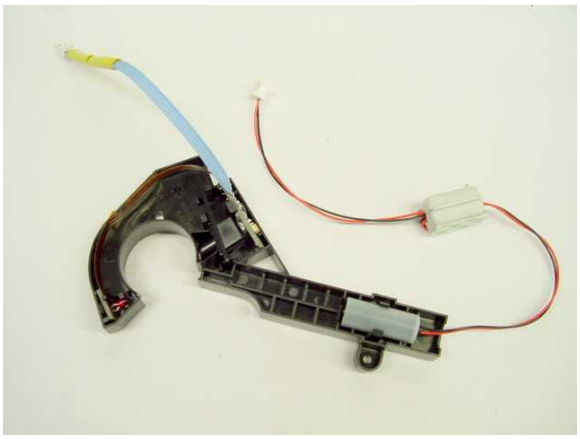
Order no.: LZV646

Cell adapter set

Order no.: LZV647

Barcode reader
(only for LPG422.99.0000x)

Order no.: LZV664 Pos. 54

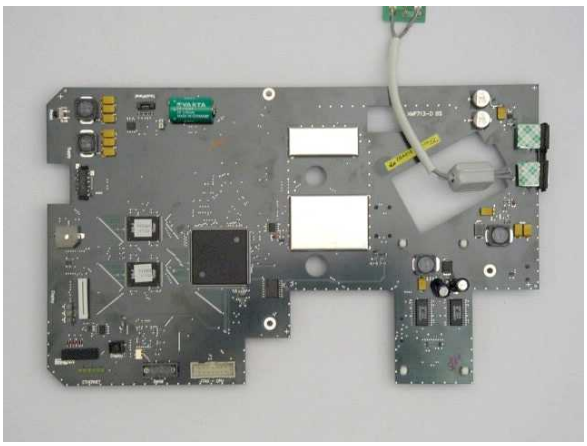


Hall sensor board
(only for LPG422.99.0000x)

Order no.: YAB053 Pos. 59

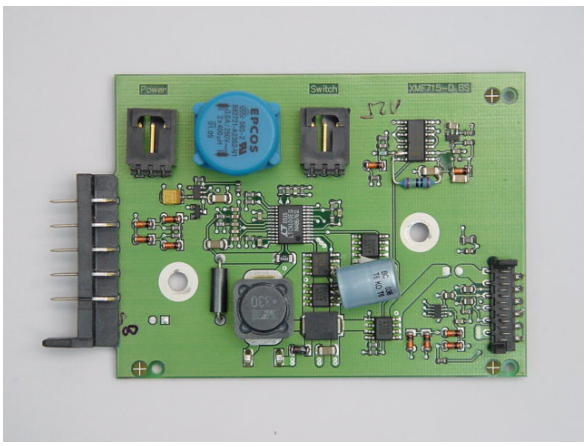
Microcomputer board
(only for LPG422.99.0000x)

Order no.: YAB077 Pos. 85



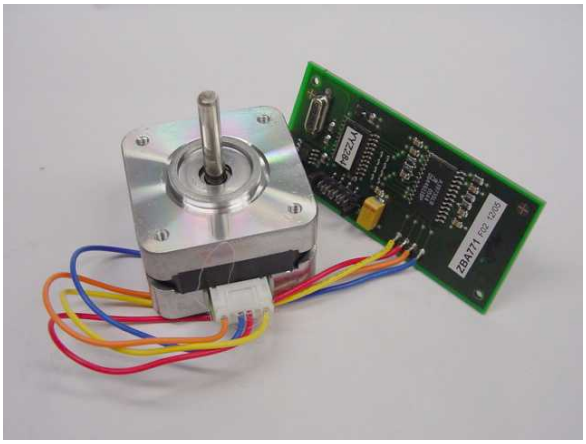
Battery power supply board
(only for LPG422.99.0000x)

Order no.: YAB078 Pos. 110



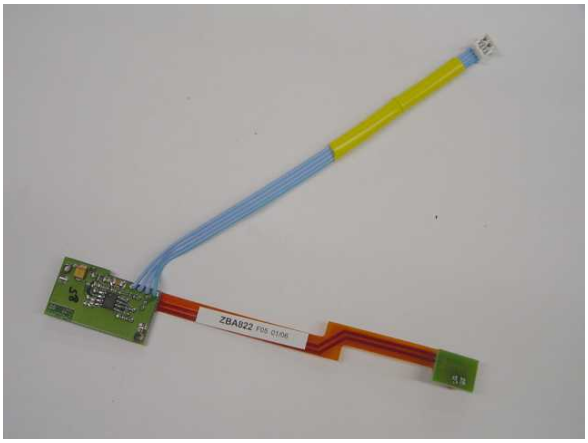
Stepper motor with board
(only for LPG422.99.0000x)

Order no.: YAB079 Pos. 10



Barcode board
(only for LPG422.99.0000x)

Order no.: YAB080 Pos. 95

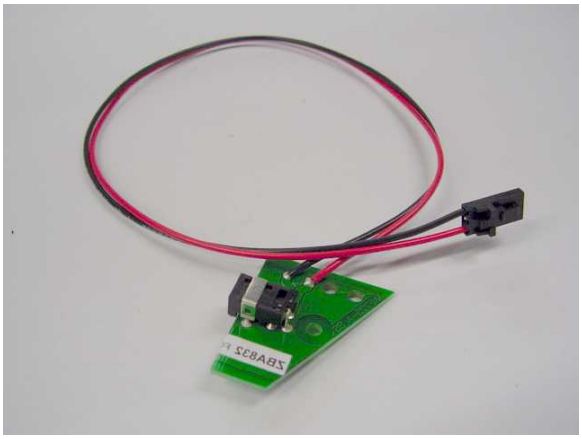


Lamp socket board
(only for LPG422.99.0000x)

Order no.: YAB081

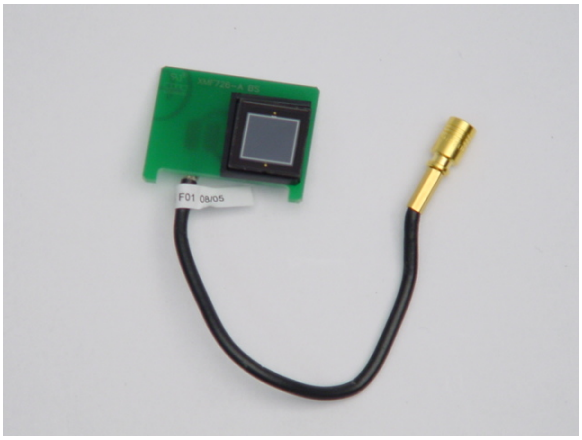
Plug-in power supply board

Order no.: YAB082 Pos. 115



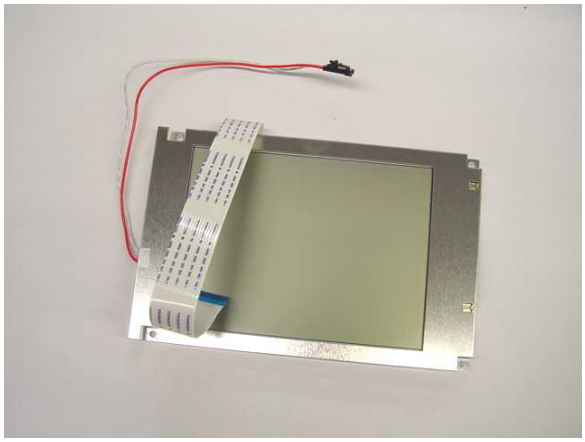
Reference board

Order no.: YAB083 Pos. 55



Display

Order no.: YAB084 Pos. 133

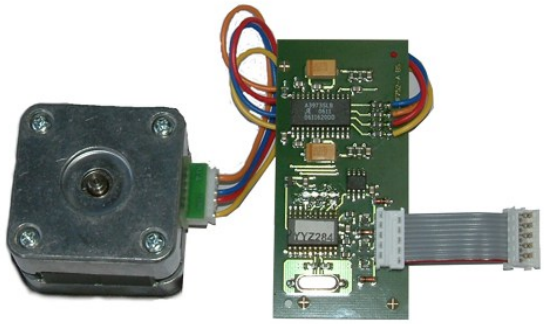


Push button (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: LZV756 Pos. 118

Grating motor (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: LZV753 Pos. 10



Lamp Connector (Redesign)
(nur für / only for LPG422.99.0001x)

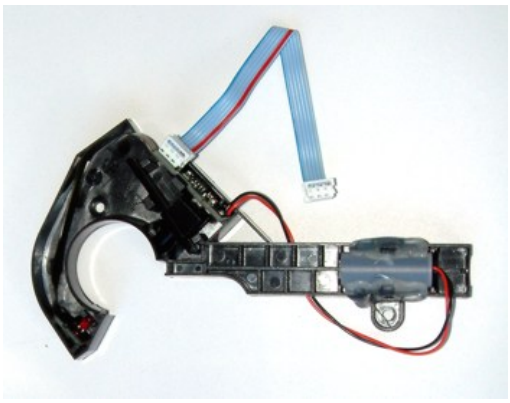
Bestell-Nr.: LZV754

Beam splitter mirror (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: LZV755 Pos. 50

Barcode Reader (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: LZV658 Pos. 54

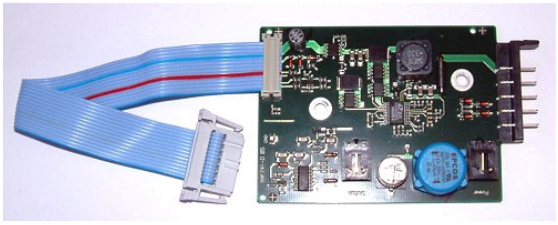


Hall Sensor PCB (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: YAB059 Pos. 59

Power Supply PCB (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: YAB052 Pos. 110



Microcomputer board (Redesign)
(nur für / only for LPG422.99.0001x)

Bestell-Nr.: YAB051 Pos. 85

9 Test aids and devices

9.1 Hardware

Only for Service Center (e.g. Düsseldorf, Ames, Prague):

HRE014	Eccentric pin
HZK007	Adhesive pad, 24 mm x 13 mm, Scotch mount 4032/tesa 4976, for attaching ferrite sleeves to housing)
LZV610	Plug-in power supply (15V/2A)
LZV551	Battery (12V)
VAA591	Validation kit
VAA608	USB memory stick with DR2800 test program
VAA643	Spacer gauge for grating
VAA646	Adjustment device for beam splitter
VAA606	Mounting aid for fixing the grating
XMB999	Detachable cable binder

USB connector cable (host/device)

Narrow strip of paper

VAA042	Adjustment cuvette for 10 mm cuvette
VAA267	Observation screen for 50 mm cuvette

Only for Field Service:

VAA591	Validation kit
VAA608	USB memory stick with DR2800 test program

Narrow strip of paper

Only for Distributors:

LZV537	Validation kit

9.2 Other

Lumberg AZ30 tongs

Optical cloth